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ABSTRACT

Case studies were conducted in industrial enterprises of varying sizes and a university library in Hong Kong that have introduced advanced technology. The studies investigated the management of technological change, vocational training, and human resources development at the workplace, as well as the repercussions on work attitudes, the occupational and skill structure, the educational background of the labor force, the government's labor force policies, and the macro labor market of advanced technology. The studies also focused on the problems of formulating public policies on personnel planning and training at the national level. Analysis of the case studies showed the risks of mismatch between skill supply and demand when the match is administered by a central program, because skill supply requires long-range planning, whereas demand is affected by short-run cyclical variations in export-oriented economies. The analysis also showed another problem that attends the application of modern advanced technology: the specificity of skills, so that enterprises that develop their own mixes of technology and skill may find it increasingly difficult to use external or government-sponsored training facilities at the national level. Finally, the studies pointed to the strategic importance of responsive and flexible training systems in order to avoid imbalances between skill supply and demand. (KC)

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Monograph 6

Vocational Training for Advanced Technology in Hong Kong

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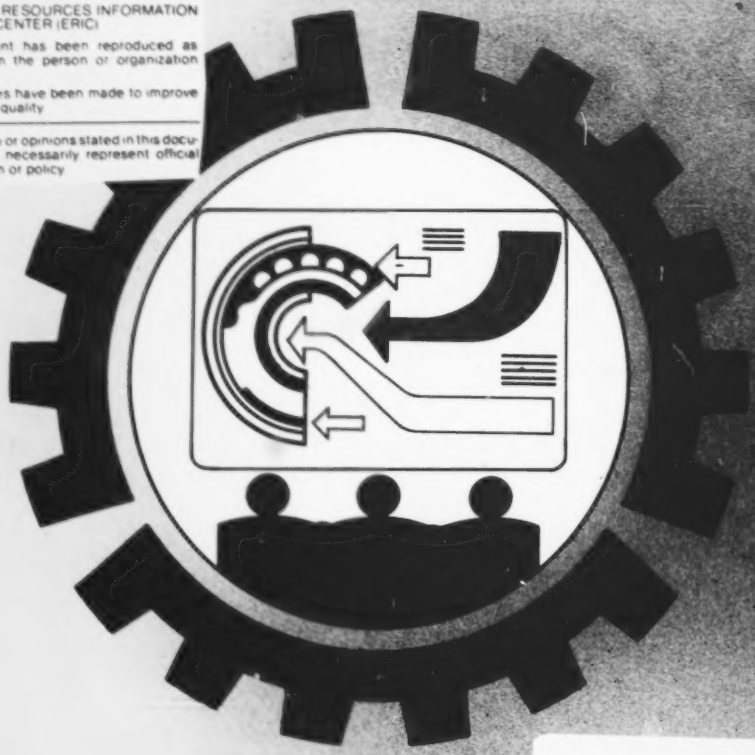

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by Ng Sek Hong
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by Ng Sek Hong,
University of Hong Kong

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Introduction

This monograph was presented by Dr Ng Sek Hong to the Regional Workshop on Vocational Training for Advanced Technology, 1-8 December 1986 in Chiba, Japan that was organised by the Asian and Pacific Skill Development Programme and the International Labour Office.

It is based on empirical studies of industrial enterprises of varying sizes and a university library in Hong Kong that have introduced advanced technology. These studies investigated, *inter alia*, the management of technological change, vocational training and human resources development at the workplace, as well as the repercussions on work attitudes, the occupational and skill structure, the educational background of the labour force, the government's manpower policies and the macro labour market of advanced technology. The subjects were electronics factories, two printing plants, a garment factory, a bank, a telecommunication enterprise, and a library. This research addressed a major gap in information about what actually happens at the workplace in preparing workers to use advanced technologies.

It also sheds some light on problems of formulating public policies on manpower planning and training at the macro or national level which may be relevant to the newly industrialised countries in the Asian and Pacific region. It warns against, for instance, the risks of discretionary mismatch under centrally administered manpower programmes, as between skill supply as a long-range planning function and its demand which is heavily constrained by short-run cyclical variations in export-oriented economies.

Another problem that attends the application of modern advanced technology is the specificity of skills, so that enterprises that develop their own differentiated mixes of technology and skill may

find it increasingly difficult to utilise external or government-sponsored training facilities at the national level. For manpower policy planners and training programme designers, it is hence imperative to co-ordinate, as far as possible, the curriculum of training and educational institutions and the practical skill requirements of industry.

Finally this monograph points to the strategic importance of a responsive and flexible manpower training system in order to avert over-production and imbalances in skill supply. In this light, it questions the suitability of the commonly accepted 'professional' or 'craft' model of vocational training in the context of the dynamism of modern industrial societies.

Rony V. Diaz
Director

Background

This paper, which was commissioned by the International Labour Office, aims to identify from the Hong Kong experience some of the key issues for practitioners and professionals in the field of human resource development and management that may facilitate the introduction of new and changing technologies for the enterprise, industry and the economy. These issues relate not only to the hardware aspects of new machinery and production methods but also to work re-design, acquisition, adaptation and other structural, relational and psychological aspects of people at work. In this connection, case studies were conducted at the micro level of individual enterprises in order to investigate the nature and implications of these issues for labour and management. The findings are summarised, followed by a brief reference to their implications at the macro level for public policy making on vocational training, technical education and human resources development.

Evidently, the human implications of advanced technology have to be approached with the aid of a framework that is multi-disciplinary. For instance, it has been popular to utilise a socio-psychological or sociological perspective in trying to understand and interpret issues at the enterprise level—topics such as managers' and workers' perception of the effects of technological change on the worker's job, task and skill, job satisfaction, and immediate work context in the enterprise, to mention only a few. On the other hand, as the discussions move to the broader levels of the industry, the markets and the economy, it is clear that economic, legal, political and social perspectives have increasing relevance and significance to interpretation. Noticeably, the inquiry will touch on economic issues strategic to the accommodation and facilitation of technological advances—such as those pertaining to the impact of new technology on the job

and skill hierarchy in the enterprise and wider labour market; career structure; manpower supply and demand; skill redundancy and transfer; concept of occupation and its connotation for training; work commitment; labour force stability and human capital investment, etc. The agenda, it follows, entail in parallel the question of institutional adaptations and reforms—namely, to ascertain the desirability of introducing new labour standards in order to regulate the various aspects of the firm and industry as they are affected by the socio-technical imperative of new technology in industrial safety, training, employment, job transfer, earning security and other working conditions.

The Case Studies

For the purpose of exploring the subject-matter of advanced technology and human resource development in Hong Kong, it is proposed first to review some local studies at two levels. An industrial study of electronics and related technical employees was conducted by the author in the early 1980s. This was followed by a series of micro studies (each focused on the enterprise) which were carried out between the winter of 1985 and the summer of 1986. Discussions of the empirical findings at these levels are envisaged to lead to the identification of some of the strategic problems for Hong Kong industry in coping with technological and human resource development. The policy implications of these issues for public policy planners, educational and training institutions in the interrelated fields of vocational training, employment, productivity and industrial development and labour administration and relations are to be considered subsequently.

The industrial study: the electronics and related industries

This group of industries was investigated by the author in 1980 – in part because these industries embodied the elements of rapid technological advances. In Hong Kong, the electronics industry occupied a strategic position in the structure of the industrial economy in as much as it now ranks second only to the clothing industry in the yield of export value in addition to being listed as the leader industry with the best potential to develop itself and stimulate the development of other industrial aspects by virtue of its proximity to modern technology.

Profile of the workplace

Briefly, the electronics and telecommunication sector comprises a variety of workplaces including (i) electronics manufacturing plants;

(ii) the 'big' telecommunication corporations; (iii) the television stations; (iv) computer servicing companies; (v) the electronics division of the public works department and the telecommunication inspectorate of the post-master general, both belonging to the civil service; (vi) the mass transit railway and (vii) the electricity power plants that use electronics technology and employ technical personnel trained in telecommunication engineering. The industry is obviously mixed not only in terms of products but also in terms of the size of the establishments and the ethnic character of the ownership and managment.

Take, for instance, the local electronics manufacturing industry. It is often differentiated into two tiers according to the levels of technological sophistication, namely, an upper division engaged in electronics components manufacturing dealing with semi-conductors, transistors, integrated circuits, computer parts and sub-systems, etc. and a lower division concerned principally with consumer products like radios, calculators, digital watches, television games, toys, and others. It is observed that manufacturing plants in the upper division are more likely to be the larger plants operated with foreign capital, mostly the local subsidiaries of multinationals. By contrast, the majority of the electronics plants, especially those financed by local capital, operate more or less as complete assemblies or subassemblies utilising relatively simple technology to put together consumer electronics products for the finished goods markets. These assembly plants in general feature labour intensive technology to sustain a typically mass production system that involves the synthesis and manipulation of relatively delicate raw materials and producer-goods. Production on the shopfloor is hence concerned essentially with assembly work – primarily bench assembly that involves installation, hand-soldering and other operations which are simple and short in cycle but require manual and visual dexterity.

For this reason, the bulk of the production workforce in these local plants is made up of young semi-skilled female workers. Key

technical and engineering personnel are engaged as well, either in direct support to plant production or assigned to separate engineering departments detached from the production lines. However, it is not unusual for quality assurance or quality control to be performed on the assembly floor—often by the more senior production girls trained as inspectors. Engineering is differentiable into various interrelated functions although the nomenclature tends to vary between enterprises. Nevertheless, certain basic engineering disciplines adopted by most electronics manufacturing works are recognisable: electronics, electrical, mechanical and production or industrial engineering, at both the technician and engineer levels.

On the other hand, the production method tends to be more capital-intensive where the manufacture of semiconductor, integrated circuit and other components/parts warrant the application of higher-level technology. Most of these plants are financed by foreign, especially American, investment. These local subsidiaries are mostly offshore manufacturing bases to produce components for the home operation of foreign multinational corporations. This functional attachment often means that the Hong Kong plants exist primarily as a type of production annex without an independent marketing network of its own. By implication, the Hong Kong subsidiaries are almost sheltered from the exigency of coping with the global product market, since the marketing function is discharged directly by the parent company at home.

In the relatively advanced telecommunication sector, by comparison, the industry is far more concentrated, constituted of two publicly enfranchised monopolies. The Hong Kong Telephone Company Limited is licensed to provide inland telephone and other telecommunication facilities within the territory, while the Cable and Wireless (HK) Limited is a public enterprise which operates the external network of telecommunication services for Hong Kong. The two corporations are linked by interlocking (share of) ownership.

Incorporated in 1925 under the Telephone Ordinance, the Hong

Kong Telephone Company is a private monopoly under state franchise rules which regulate its standard of services as well as subscription charges and rate of return. In the early 1970s, the pressure of growing public demand induced the company to adopt widespread technological innovations in order to augment its capacity. Thus, the electronically monitored exchange was introduced into the telephone cable network, complemented by the installation of a system of microwave circuitry. Automation of the exchange network was completed by 1980, with the substitution of the earlier electromechanical switching systems by increasingly advanced electronic systems. This process of planned technological obsolescence led the company to institute a manpower scheme designed specifically for the training and career development of electronics technicians. As a result of the expanded services made possible by technological advances, Hong Kong was able to attain, by 1980, the highest telephone density in Southeast Asia. It succeeded in providing 1.6 million telephones for a population of about five million people (at a ratio of more than 31 telephones for every 100 persons. Besides telephone and ancillary services, the adoption of electronics technology enabled the company to diversify into adjunct business lines—notably a radio-paging service and viewdata (an information service linking a television set, via telephone circuits, to a computerised data-bank).

Parallel to the Hong Kong Telephone Company is the Cable and Wireless Limited (Hong Kong), a public monopoly linked to the UK Cable and Wireless Limited and licensed to supply the territory its entire external telecommunication service. Incorporated now as a local company backed by equity participation of the Hong Kong Government, this telecommunication enterprise consists of five major divisions (including administration, finance, telecommunication services and marketing, international engineering and local engineering) and staffed by a workforce of about 3,000 employees—mostly technical and engineering, organised into nine occupational scales. The rapid growth in the demand for the corporation's telecommunication

services in the 1970s mirrored the significant development of business in the local economy. These advances in turn led to spectacular increases in the company's scale of operation and employment. Within the three-year span between 1976 and 1979, for instance, its workforce grew from 1,800 persons to almost 2,500.

The application of modern electronics technology is manifested, in addition to manufacturing and telecommunications, in the television industry. Prior to 1967, the industry was a monopoly run by a single company licensed to transmit programmes by cable relay. In 1967, the Government enfranchised under the Television Ordinance a wireless station to replace the original license for cable transmission. Intense competition has since given a powerful stimulus to the industry to innovate both in terms of technology and programmes.

A branch of growing importance in the electronics sector is computer servicing, given the expanding demand for data-processing. Most of the computer hardware sales outlets in Hong Kong are the local branches of foreign multinationals which may either specialise in computer systems or provide a variety of product lines including audio-visual equipment, medical instruments and other so-called 'professional service' installations.

Apart from the above industries, a number of public utilities, notably in the transport and energy sectors, are increasingly being penetrated by computer technology. The underground mass transit railway, managed by a public enterprise, generates a significant demand for technicians in computer maintenance with its highly automated traffic network. The growing reliance of power plants on computerised control in electricity production also means that the power companies are recruiting technical staff in the electronics field.

Training of the Technicians

The classic conception of the training approaches for large-scale corporation engaged in modern technology is typically anchored to the model of enterprise-specific training, itself reminiscent of the

notion of the 'internal labour market'. The logic of such approaches is often stated as follows:

> The programmed nature of advanced technologies emphasise the application of highly specific yet narrow technical skills. It stems also in part from the corporate strategy of business of 'monopoly capital' to differentiate their production system, skill and technology from those of other enterprises, as a weapon to strengthen their competitive position and their domination of both the producer and the labour markets. Accordingly, the modern corporation endeavours to develop an enterprise-based internal labour market, and to back it with in-company training of the technical staff for specific tasks. The low transferability of skill thus implied creates a stable technical labour force for the employer. However, at the same time, it also creates an enclave for the technical employees.

The assumption has therefore been, in the instance of the advanced sectors of highly industrialised economies, that specialisation and specificity of production are characteristics of enterprises in the industry. Internalisation of training thus stems from this situation, in as much as 'the worker will, after a training period of varying length, acquire a practical skill which he will only be able to use in that firm, and the knowledge thus gained will not be directly useable in an equivalent job situation in a different firm'.[1]

Nevertheless, in the Hong Kong situation, training in the electronics and telecommunication sector is not entirely consistent with the above model in spite of its relatively advanced technological state. First, systematic training organised by and tailored to the specific production conditions of individual enterprises is not altogether common here. Second, considerable diversity exists in these technicians' training experience, which may vary in arrangement and duration according to the needs of and resources available to particular enterprises. Some technicians may be given little training beyond the technical instruction obtained from external institutions like the poly-

technics, the technical institutes or the secondary technical schools. These graduates are expected to be almost fully operational in their jobs upon recruitment. Such practice is typical of the small or medium-sized industrial plants, which possess meagre capital and resources to spend on training. In these situations, elements of formalised training (which involve the systematic communication, learning and acquisition of skill and knowledge) are virtually minimal or absent. Instead, training is diffused and implicit in the on-the-job experience—often, a bizarre process of trial-and-error osmosis.

The training in the multinational electronic plants, organised according to prescribed modules or programmes, is more structured. Generally speaking, the mode is either to run inplant training programmes in conjunction with on-the-job exposure of the trainee, or to complement these with a third element namely, their theoretical instruction at an outside training institution. On the whole, these training arrangements are adapted to suit the production requirements of the individual workplaces; but there is often an occupational or industry-wide dimension to these, especially where the trainee is sponsored for the theoretical courses in training institutions.

On the other hand, training is probably most formalised where it constitutes a specialised managerial function, as for the monopoly utility corporations. These enterprises, which include the telecommunication corporations, the power plants and the mass transit railway, can afford to invest substantial amounts in training. These involve, among others laying aside expensive space to accommodate training schools/centres/bays, installing equipment, hiring professional trainers and other specialised personnel, as well as releasing the technical staff from work to attend courses.

In summary, the pattern of vocational training in this industry is reflected in the findings from an industrial sample of 35 firms investigated in 1980. For two of these subject establishments (*i.e.* 5.7 per cent of the sample), management conceded that their organisations lacked virtually any training facilities for their technical staff.

Another one-quarter (or 25.7 per cent) of these enterprises indicated that they did not organise any training function beyond their on-the-job requirements. More wholesome company-based training efforts were reported by only twelve of these enterprises (or 34.3 per cent of the sample). Within this sub-group of firms, in-plant training programmes ran parallel to on-the-job practical assignment, sometimes backed by institutional class instruction. Conceivably, the most comprehensive approach to organised training would embody all these three elements; but such practice was relatively sparse within the industry, as reported by only two firms (5.7 per cent) in the sample.

It appears that the most common strategy adopted by these electronics enterprises in training or developing their technical personnel was to exploit external resources given by the array of technical courses organised in government-sponsored technical institutes or the polytechnic. Thus, for 12 firms (34.3 per cent) in the sample, the company trained their technical staff by putting the novice on the job while releasing him (in the evenings or on a part-time day-release basis) for outside institutional courses to strengthen his theoretical understanding of his job.

This mixed approach, however, has been viewed with scepticism since more often than not, these two aspects of training are often not well integrated. This is because the theoretical courses are general in nature, not tailored to suit the specific production conditions of individual plants. The weak congruence between the plant's and the technician's practical needs on one hand and theoretical instruction in educational institutions on the other has been a source of frequent complaints among these technicians about their training experience. Moreover, not all firms offer their technicians ample assistance to enable them to attend external courses in institutions of technical education and training. Just more than half of the 35 firms studied (57.1 per cent of the sample or 20 firms) indicated that they gave support such as financial aid, time-off or study-leave arrange-

ments. However, seven establishments (or one-fifth) of the sample reported that none of these support facilities were offered to their technical staff. The rest of the sample (or 22.9 per cent) were 'midway' in providing support, giving their technicians either financial assistance or time-off/study-leave arrangements.

In summary, technician training in this sector of modern technology is pluralistic, fragmented rather than integrated at the enterprise or industry level. A substantial number of these enterprises lack a clear and defined policy on manpower development. That not all establishments in this sector are vigorously committed to the strategy of 'human capital' investment within the firm raises the basic question: how do these firms meet their manpower requirements to cope with the demands of their technology and production specificities?

To a large extent, the dual market notion may help to explain these variations in the training situation between different firms in the industry, especially as regards the maintenance of a competent technical workforce. Market segmentation appears to feature in this industry in as much as the large-scale bureaucratic establishments can be distinguished from the smaller workplaces in the manufacturing sector in terms of their employment, training and human resources policies and practices. Operating in the primary market are the modern corporation-like organisations including the telecommunication and television plants, power company, mass transit railway and the government's post office and public works departments which generally offer better pay, steadier job tenure and more ready promotion chances. In addition, some of the other primary firms are small commercial firms that are the local branch offices of multinational companies such as NCR, Philips and ICI, etc. Although the limited scale of operations of these branches in Hong Kong makes it difficult for these visiting firms to develop the local equivalents of their internal labour markets as in the parent enterprises, the managerial practices of these computer sales and servicing houses tend to emulate

those of their giant home corporations. On the lower terrain of the technician's labour market is a group of production plants in manufacturing, where competitive capitalism predominates. This lower or secondary crust can be further differentiated into two substrata according to the national origin of the capital for these factories. Accordingly, a distinction exists between the bigger industrial plants, concentrated in the (technologically) more advanced field of component/computer parts production and managed by multinational (predominantly American) capital on one hand, and on the other hand their local Hong Kong Chinese counterparts–generally the smaller industrial firms concerned chiefly with the production of less sophisticated items such as electronics consumer products.

Strategies of human resource development hence diverge rather significantly between the primary firms in the protected sector of the public services and utility monopolies and the industrial plants in the manufacturing sector susceptible to global market competition.

The acquisition of formal educational qualifications is viewed, for instance, as sacrosanct by government bureaucrats as the basis of qualifying their technical personnel. In the civil service, a demarcation exists between the professional technologist and the technician. Their boundaries are described by rules of recruitment prescribed in terms of academic credentials. The situation among the public utilities is somewhat analogous. For example, entry into the 'engineer' grade in the Government Public Department requires either a university degree or satisfying the British Council of Engineering Institutions Part II Examination. The port of entry into this grade is normally by way of external recruitment from the wider market at the assistant engineer rank, and promotion from below among the telecommunication assistants is rather unusual. The utility corporations have impersonal rules to regulate the recruitment process. The Hong Kong Telephone Company stipulates, for instance, that admission into the electronics technician grade requires the possession of either of the following academic credentials:

(i) a Technician Diploma; or

(ii) a City and Guilds Institute of London Certificate in Telecommunication; or

(iii) a Higher Certificate in Electronics Engineering Year I; or

(iv) GCE "A" Level in at least two subjects including mathematics and physics at Grade D or above.

By contrast, in the electronics manufacturing industry, reference to formal academic qualifications is more haphazard and variable among different plants. While the foreign multinationals generally follow some standardised procedures of recruitment and apply 'scientific' techniques like job analysis and job specification in the process, their selection procedures permit a more elastic approach to given academic requirements than either the civil service or the public utility corporations. On the other hand, among the medium-sized and smaller plants–especially those of Chinese local capital–their technical manpower is largely tapped from the open market, comprising in the main of the self-made technical workers whose labour power often rests more on their shop-floor experience than on their academic credentials.

These variations in manpower selection practices to a certain extent mirror the differential impact of technological advances upon different workplaces in the industry. Among the utility corporations, for instance, their formalisation of their recruitment procedures was relatively recent, resulting from an organisation-wide rationalisation during the last decade of their corporate manpower structure in the face of rapid technological innovations. Conversely, the smaller local plants in the more competitive export manufacturing sector are less credential conscious but more market oriented–probably also because of technological constraints. While these factories mostly operate in product lines of lesser technological sophistication (so that they can afford to survive with a comparatively low overhead on their research, diagnostic and innovative capabilities, thus enabling them to attach a lower premium to the academic standards and theo-

retical versatility of their technical staff), the techno-structural specificities of these works also contribute to the lesser emphasis they place on recognised external qualifications. For these smaller businesses, the logic of their calculus in manpower and production is often short-term and direct: to secure the best tangible contribution of the workers to the company's production capacity as measured in dollars and cents. These Chinese firms tend to, instead, put greater faith in the practical job exposure and experience of their technical personnel and for that reason, may remain sceptical about the adaptive power and industrial value of the academic achievers.

In summary, large-scale technological innovations appear to have induced the utility corporations and public bureaucracies to move towards the strategy of internalising their labour market– notably that of their technical manpower pool. This is evident in the systematic in-company arrangements on internships and traineeships designed specifically to meet corporate-specific demands for technical skills. Thus, almost every major telecommunication or utility enterprise has developed relatively structured training schools/centres. Their training modules, often complemented by theoretical courses run either at the company's training centres or in outside educational institutions, typically last six months or longer.

There is yet another form of training in private industry which is institutionalised by way of apprenticeship, carried out by the individual enterprise but under central official sponsorship. The scheme, prescribed by the Vocational Training Council, its Electronic Industry Training Board and the Apprenticeship Division of the Technical Education and Industrial Training Department, is modelled largely upon the British system described by the 1964 Industrial Training Act. In essence, such four-year indenture arrangement combines practical on-the-job training in the firm and related theoretical education at a state-supported educational institution through the part-time day-release (PTDR) method, specifically to attend the higher certificate or certificate courses at either the polytechnic or a techni-

cal institute. The role of the Government, in addition to administering these courses in the training/educational institution, is principally performed by the Technical Education and Industrial Training Department. Besides inspecting the apprentices in their firms, the Department acts as a recruitment office by placing the novices (who apply to the Department upon graduating or leaving their secondary schools) with the participant firms for apprentice training. Therefore, for these technical workers whose port of entery into the skill market is *via* this formal type of apprenticeship, the official agency helps standardise their educational attributes by controlling the admission process, namely, Form Five secondary level as the qualifying standard. Such apprenticeships appear to be most popular in the manufacturing sector, in particular among the larger multinational plants.

The provision of technical education for this industry is correspondingly in a hybrid state, as the public educational system apparently undergoes its transformation in order to align better with the industry's and the economy's manpower needs. Being evolved now is a four-tier hierarchy of technical institutions to match the stratification of the manpower structure into the successive layers of the technologist, technician and craftsman. These institutions have developed a variety of technical courses which in turn lead to the proliferation of academic credentials relevant to technician hiring. Moreover, the lack of uniformity in the employers' practices of recruiting technicians also implies the varying importance that the work organisation attaches to formal educational qualifications, compared with practical skills and job experience.

This mixed situation reflects a hybrid educational structure and in parallel, a spectrum of organisational strategies in technician hiring and training. At one end of the spectrum are the public and utility service organisations which recruit according to bureaucratic norms that exalt the possession of academic credentials. Conversely, private employers, especially the smaller local Chinese manufacturing plants,

are less conscious of formal qualifications and ready to recruit 'unqualified' or 'less qualified' technical workers by upgrading them from the shopfloor by virtue of work experience alone.

Technological Changes and Union Response

This industrial study of the electronics sector highlights another important aspect of the human implications of technological innovations—the 'industrial relations' response of members of the industry. An interesting illustration is the formation in the early 1970s of the Cable and Wireless Limited Hong Kong Non-expatriate Staff Association.

Prior to 1970, technicians serving in the corporation were generally docile in unionism, whilst the process of pay determination was fairly simple, governed more or less by automatic adjustments emulating those in the civil service. Labour-management dialogue was hardly institutionalised, and lacking from the workplace were formal channels for the collective representation of the employees' grievances. It waited for technological innovations around the turn of the 1970s to spark off the technicians' equity consciousness and their subsequent demands for changes.

Among the various measures introduced by management to rationalise corporate administration in order to accommodate these hardware changes was the establishment of a computerised switching centre. The new department served to link up different subscribers to different routes throughout the world, and its manning generated demand for a new grade of technical staff, the computer programmer. The dearth of such specialised skills in the internal manpower pool of the corporation meant that the company had to recruit from the external labour market. Nevertheless, high labour turnover in the grade and difficulties experienced in recruitment soon induced the company to raise substantially the salary for this new grade alone. The disturbance caused by this shift in pay scale to the traditional structure of internal relativities sensitised the other (technical) staff mem-

bers to question the logic of such an *ad hoc* pay decision.

The privilege given to the computer programmers therefore, provoked the discovery of a common sense of workplace solidarity among these technicians, subsequently manifested in a series of collective industrial actions. The argument was advanced by these staff members that their pay should be placed on a basis comparable to the civil service salary scale for similar occupations. Management responded by agreeing to consult and negotiate, provided that the staff members were properly represented. This managerial reference to staff representation inspired the latter to conceive of a union.

The union, newly formed, was hence first registered in November 1970. It declared to adopt the principle of western economic trade unionism of the Anglo-American model—as a bread and butter type of labour organisation. It has hitherto confined its policy and activities to the goal of seeking the collective betterment of members' job interests, by negotiating with the company on employment conditions.

It may be worth mentioning another instance of union development in the public enterprise that operates Hong Kong's underground train services. This again attests to the impact of modern advanced technology upon human and man-machine relations at work. The computerised train services have important implications for the jobs and attitude of the train drivers and other staff members in the operating department of the company, notably the station regulators and masters. Their work emphasises precision but is at the same time highly structured and programmed under central computer control, leaving little scope for discretion. Subject to intense work pressure, dictated by the routine and pace of train automation, these operating staff members were often frustrated in their job—more so because of their relative isolation, irregular schedule and variable workplace compared to their colleagues.

Members of this operating department organised themselves in 1980 into an enterprise-based union: the Mass Transit Railway

Operating Department Staff Union. It has not succeeded in widening its membership to other grades outside the operating department. Its restricted ambit of organisation has given management a powerful reason to evade the union's repeated demands for recognition.

In January 1984 the union was recognised by the company—after four years of protracted haggling. In its euphoria, the union attempted to call a strike four months later in protest against a new scheme of flexible roster work schedule introduced by the management. However, militancy withered away quickly and the strike action was aborted. Paradoxically, it appears that the factor of advanced technology, by exposing the train drivers and station staff to the perils of job insecurity on the labour market, has impeded the staying power of the union. The technical possibility of substituting the striking drivers with a standby pool of reserves made the drivers quiesce when the management threatened to impose sanctions of dismissal. Thus, it was observed:

> 'In this connection, the substitutability of the striking drivers implies, on one hand, their limited ability to cripple the operation of the underground rail service by any critical degree. On the other hand, these workers are also vulnerable in their employment, especially since their conditions are generally considered to be "privileged" *vis-a-vis* junior technicians of comparable educational qualifications on the private sector market. Given such "aristocratic" hiring opportunities and terms, it is evidently a more potent sanction for the employer to withhold employment than for the workers to withdraw their labour temporarily by going on "strike". Thus, the "dismissal" communique was instrumental in overcoming the strike'.[2]

Notes

1. Serge Mallet, *The New Working Class*, Nottingham, 1975, p. 64.
2. Ng Sek Hong, "Mass Transit Railway Tussle, Performance" in *The Journal of Human Resources Development*, Vol. I, No. 4, (Hong Kong), November 1984, p. 30.

The Case Studies of Six Organisations

In addition to the industrial study of the electronics and telecommunication sectors, another series of empirical studies was undertaken in the winter of 1985.* It covered altogether six case studies of work organisations–three in the manufacturing sector and another three in the non-industrial service sector. The primary objective of this series was to investigate the impact and implications of technological changes on human behaviour in the workplace. Recognising the problematical nature of vigorous abstraction of the notion of 'technology', the study focussed, for operational purposes, upon 'computerisation' as that process of 'technological innovation' could be meaningfully represented to the respondents. That the 'technological' variable should be readily perceptible to the people affected in the workplace (that is, both the managers and the workers alike) was thought to be strategic to the identification and assessment of the socio-psychological effects of changing technology in the human work organisation. In the wake of information technology and its widening application to industry, computerisation is a 'hard-core' process that engenders ancillary programmed functions, digital control and automation of various work/production tasks probably affords a ready benchmark for describing modern technology. The study was thus designed to draw its data from a spectrum of industrial/service organisations that were known to have recently undergone computerisation whether partial (as limited to specific departments, functions and jobs) or organisation-wide. Six such organisations were studied accordingly, selected from the following industries:

*This project was undertaken jointly by Professor Henry Kao and the writer.

Industry	*Number of subject firms*
Manufacturing:	
Printing	2
Garment (pleating)	1
Non-manufacturing:	
Telecommunication	1
Banking	1
Service institution (*viz* university Library)	1

In each of these six organisational case-studies, management as well as a small sample of its workforce affected by computerisation were interviewed, using different questionnaires. In the employee questionnaire the individual respondent was tested for his responses to technological innovations with reference to his job perception and job attitudes at the workplace. In parallel, the management questionnaire focussed on the features and policies of the subject institution as regards its experience in technological innovations as well as the implications of large-scale computer application on its managerial actions in terms of its task organisation, work procedure, skill requirements, manpower, training and other personnel policies. Each of these six cases is described below:

Case I: a Chinese printing press

This plant started in 1946 as a small letter-press shop with just ten workers but now has a workforce of 150, achieved largely by developing overseas markets. At present, about 85 per cent of its products are exported.

Structurally, the firm was organised into three main departments, *viz* (i) sales and marketing; (ii) production, and (iii) mainte-

nance and engineering. The production department was in turn made up of the main sections of design and plate-making, the press-room, and binding. Over the previous five years, the plant has been in part computerised notably after 1979 when the press moved to its present plant. Such re-location, apparently prompted by the prospect of opening overseas markets for the printing industry during the 1970s, was accompanied by the plant's advances in printing technology, as it moved towards offset printing from the older letter-press method. Mechanisation was thus facilitated and computerisation, although on a limited and *ad hoc* basis, followed, featuring: (i) introduction of 'numerical control machines to the press-room so that about 30-35 per cent of the printing work is now automated'; and (ii) partial automation of the office work, now supported by the installation of two mini-computers.

According to its management, the rationale behind their 'high technology' moves appears to be their intent to improve both the productivity and quality of printing, in addition to their anxiety to stabilise their production capacity in the face of competitive pressure on both the product and skill markets. However, any decisions on the search for and adaptation of new products and technological know-how were taken largely on an *ad hoc* basis in spite of the involvement of the general manager who was ready to consult the relevant department heads prior to his making the decisions. Often, this meant the absence of any coherent and well-defined company programme on technological and product innovations. Neither was there a research and development department, nor any regular fund assigned from the firm's budget to product design and development. Technological changes were by and large conceived in terms of new machinery introduced and hence limited in ramifications to say, its commissioning and installation, the transfer and training of personnel to operate and service the machinery. Such hardware changes were seldom supported by ancillary projects in work study, job re-design, definition of new work procedures. Instead, it was customary for the

management to communicate information and instructions on new products and new machines through haphazard messages–or simply to leave the workmen concerned to feel their way through osmosis.

In a sense, the informality of the human aspects of technological innovations was also manifested in the firm's feeble approach to long-term manpower provisions and adjustments. Its activities in marshalling human resources have been essentially respsonsive, tailored to the 'demand-pull' of technical requirements for production so as to maintain the appropriate level of organisational activities given by its volume of production order on hand. Anxious to satisfy the buyers' order, the firm professed its preference to recruit qualified and skilled personnel from the external skill market, or to train its own workers and staff, or even to upgrade its manpower utilisation by adopting newer and more machines. Despite the technological upstream, its manpower structure has not been subject to any intense pressure for rationalisation. Thus, its management reported no major shifts in its personnel policies as regards (i) recruitment; (ii) personnel selection; (iii) promotion; (iv) performance appraisal; (v) retrenchment and lay-off; (vi) training; (vii) payment and (viii) discipline–attributed to the introduction of numerical technology on a fairly large-scale basis.

The relatively docile manner by which computerisation and other technological changes were received by the firm and its workforce was somewhat corroborated by the workers' responses, as illustrated by a sample of nine employees drawn from three principal departments and having experienced some aspects of the computerisation or numerical control process. In terms of their level of satisfaction, there was very sparse evidence on the negative repercussions of automated operation felt by the workforce. Possibly, those workers who stayed through the process either did not see much rupture in their job or succeeded to adjust gradually–otherwise they would have quit their jobs.

In summary, no coherent strategy was adopted by the company

in managing the manpower and human aspects of technological changes, apart from the transfer and re-deployment of personnel so that the younger, better educated and those with better adaptability to innovations were more likely to be assigned to work on the new machines. Internal training was occasionally organised by the factory manager or the relevant heads of departments; but these activities were principally limited to skill training in order to meet rising technical demand in work, notably to install and maintain the new machines. Managerial and supervisory training was hardly known, neither was there much training of the workforce in human relations, especially in helping individuals or work groups to adjust to the pace and other socio-technical features of new machines. The engineering department was responsible for introducing the new hard ware but in order to save on training outlay, it relied rather heavily upon the supplier of the machine to help train the maintenance crew and the machine operators under the integrated fee structure of 'commissioning'. Nevertheless, a training manual in Chinese was prepared by the works manager for training purposes. Obsolescent jobs were not widespread, as a significant proportion of the conventional printing press was retained so that the problem of re-training or retrenching the older skilled workers did not arise on a large scale. The firm found it unnecessary to introduce bonus incentives or other important changes in the monthly payment system in order to acclimatise its workers to operating the digital press.

Case II: a British printing plant

This printing press was originally founded by Australian capital in 1967 but sold in 1984 to British interest. The plant specialised in security printing of such items as cheques, bonds and certificates. It was less export-oriented than the Chinese printing firm; 70 per cent of its products was sold locally and the other 30 per cent to overseas markets like Southeast Asia and the Middle East. Its 180-strong workforce was organised into the six departments of sales,

production, works study *(i.e.* operations and methods), stationery, service *(i.e.* receipt and dispatch) and the general office.

Printing technology of the plant can be described as relatively advanced compared to the industry. Sheet-fed printing (a modern version of letter-press) was used when the press began in 1967. Rotary printing was introduced in 1979 and computer printing in 1982. Today, the press uses the letter-press method (better suited for small batch printing) for half of its operation; for the other half (large-batch production) offset printing is used. It was anticipated that within the next five years, computerised printing would increase mildly its share to about 15 per cent; the proportion of rotary printing would be augmented to around 45 per cent—with the same percentage to stay under sheet-fed conventional printing. Concomitant to technological innovations on the shopfloor was the computerisation of certain aspects of office support work, notably inventory reports and invoice processing.

The search for and adaptation of new products and technological know-how were functions largely of the operation and method department. Apart from such activities of technology improvements, the firm also performed sales research through its marketing department. However, the annual percentage of the firm's budget assigned to research and development activities was relatively meagre, seldom above 0.1 per cent.

The enterprise experienced significant organisational restructuring as it evolved to its present technological state. The operation and method department was started in 1981 for work study and research in production methods; a computer section was added to the production department in 1982. On the other hand, the composing section for letterpress has become largely obsolete, having shrunk to a mere skeleton size. On the production floor, automation now allows wider ratio of control, as the ration of supervisor to subordinate was raised from 1:8 (five years ago) to 1:12 today.

On the whole, automation and computerisation resulted in sub-

stantial labour cost savings, estimated by the management at about 50 per cent during the six years since 1979. Work rationalisation has not reduced the size of the firm's manpower which grew in fact from 130 to 180. The savings achieved on labour have been more than offset by business growth: sales volume having increased by almost 100 per cent over the last five years. Attributing the adoption of new technology to the three-fold imperative of (i) competition on the product and skill markets; (ii) quality improvements; and (iii) productivity upgrading, the firm generally followed the following procedures in commissioning new machinery:

(i) Research and work study by the operations and methods departments;

(ii) Formulation of a training programme for inducting the workers into the tasks involved;

(iii) Installation of machines;

(iv) Running-in of the hardware installed by the operations and methods department as training proceeded;

(v) Transfer of responsibility for overseeing and operating the machinery to the production department which assimilates it into the overall production process.

Management was on the whole more perceptive of the human relations problems implied by technological innovations in this firm than in the previous one. They noted, for instance, that such changes with the implied effects of skill obsolescence were likely to provoke suspicion and apprehension among the workers on the shop-floor, especially among the older tradesmen who resented the threats of skill displacement. Nevertheless, it still lacked a wholesome human relations strategy to facilitate the socio-psychological adjustments of the workforce to the new methods of production and technology. Rather, the managerial approach towards the 'human' issue of techno-structural changes has also been informal, fragmented and non-specific. It has been the normal practice of the company not to prescribe any written set of procedures or policy guidelines on the intro-

duction of new products or new techniques of production. Often, the firm preferred to communicate the new measures and associated changes to the affected employees orally, for reasons that formal instruction and directives might arouse over-reaction from the workforce. Under such situation, the shopfloor supervisors often became the key intermediaries entrusted with the role of briefing the rank-and-file workers and staff on managerial decisions regarding technical and work changes. However, it has been on the whole necessary for group briefing sessions, production meetings and departmental meetings to convene at more frequent intervals before and after the introduction of new hardware items.

As already noted, this British-owned printing plant was in general more vigorously oriented towards the manpower issues of training, skill acquisition and retention than its Chinese counterpart in the first case. Specifically, the production department formulated its manpower programme and reviewed it regularly at about half-yearly intervals. The rudimentary features of an internal labour market were discernible in manpower strategies such as the stated preference to train the plant's own staff and workers, instead of recruiting skilled personnel directly from the wider labour market. Alternatively, it might seek to upgrade and improve productivity by way of technological innovations. Given its market orientation, the firm was reluctant to hold back its operation in order to accommodate the stringency of manpower shortage.

The responses of the printing workers in the production department suggested a mild degree of alienation, as reflected in the following report:

> '...because of the higher degree of mechanisation and division of labour entailed by computerisation, it was likely for the workman to be entrusted with smaller job discretion over a narrower work segment. It was hence "natural" for him to develop a feeling of impotence and insignificance. This also limits his ability in utilising different skills, limits his scope of

social relationship and provides little chance for him to distinguish his performance.

'Before computerisation, work mostly required manual skills which could be obtained through on-the-job training. Besides, less specialisation of work and a smaller hierarchy enabled a more intimate relationship to be developed. A different picture emerged after computerisation. Employment of advanced technologies now required specific technical training for workers. This limited the workers' chances of developing their abilities in various fields and brought about greater social isolation.

'Advances in technology brought along more discrete and simplified tasks. Greater degree of specialisation imposed difficulties in processes of communication among workers as well as between workers and managers'.

The reaction of the workers was to a certain extent reflected in turnover. Technological innovations, according to management's observation, precipitated a temporary surge in the firm's level of labour turnover. However, this spurt soon subsided and was followed by a gradual decline of the turnover rate. Possibly, such variations attested to a reactive process of the workers' self-sieving in face of the repercussions due to innovations. Thus, those who could not cope socially or psychologically would have resigned, leaving those who were able to adjust to the process of technological innovations to remain as a (perhaps) more committed and consolidated workforce of greater stability in the organisation. For training and human resource utilisation purposes, the printing plant performed such functions as work study, job analysis, job description and job specification. A short training manual on essential printing skills was prepared by the production department. Technological upgrading generally implied, for the firm's orientation towards human resources, the effects of:

(i) recruiting new workers with higher educational levels;

(ii) focussing on the motivational and psychological suitability of the job incumbents, especially for the newer tasks;

(iii) placing a greater premium on the workers' technical knowledge and their receptivity to it than to mere application of mechanical skills;

(iv) because of (i) to (iii), favouring the recruitment of younger workers compared with the older tradesmen of traditional skills.

In spite of the relative absence of any salient policy adjustments in payment system, incentives, discipline and retirement arrangements, the management agreed that the imperativeness of new technology had induced them to adopt more vigorous measures in training (notably, as manifested in the higher frequency of overseas training, especially for specialised technical skills in commissioning new machinery), performance appraisal (which facilitated personnel selection, merit adjustment of pay and ascertaining training needs) and monitoring the workmen's job attitudes and satisfaction. However, to avoid provoking the workers' over-reaction, these measures were maintained at a low profile and not purposely linked to the technical process itself.

Case III: a garment-making (pleating) shop

This plant was operated by domestic Chinese capital and managed largely on a family basis. It was founded and still headed by the father (as the managing director), assisted by his son and son-in-law. The son was responsible for engineering, plant planning and development (as a 'lay' assistant on a part-time basis) while the son-in-law supervised production and marketing as a full-time director. Under him were three sections on the production floor tending the automated setter and the three pleating machines, two of which were automated and the other manually operated. About five-sixths of the pleating work was automated, leaving one-sixth to manual operations.

The incentive to the management of introducing technological innovations to the works was summarised as their interest in produc-

tivity and quality improvements due to competition. Specifically, these took principally the form of new machines introduced to the plant following such general procedures as:

(i) Procurement of machines;

(ii) Installation of the hardware;

(iii) Dispatch of an engineer/technician from the machinery supplier to the firm to help the workers familiarise themselves with the operation of the hardware;

(iv) Training and deploying workers to man and service the machine.

Decisions on innovations were in general centralised in this small factory hiring about 40 workers. For instance, it has been normal that the search for and adaptation of new products and technological know-how were initiated by the managing director on his overseas study tours mainly to Japan. These tours enabled him to update his knowledge both on machinery as well as the latest fashions or product design. Innovative ideas were thus introduced into the operations of the plant. However, apart from spending on such overseas study tours (about 2 per cent of the overall annual budget), the firm did not provide resources for any specific research and development functions.

Automation was first introduced into this family-run business in 1979 when its business volume picked up rapidly. The volume multiplied by almost ten-fold during the period 1979 to 1985. Presumably, this growth in business and production level was made possible by the significant improvements in labour productivity brought about by automation. The management reported that for every 100 units of output it now required two units input of labour, as against 15 units labour input six years ago.

Automation has precipitated perceptible organisational variations in the workplace. Alongside with the growth in production and workforce size, three automated pleating sections were added to the old works on hand pleating. Automation led to the formation of more yet smaller work units—each averaging six to eight persons,

compared to a manning scale of one supervisor to ten workers under the manual system. Despite these techno-structural advances, the style of supervision has remained informal, traditional and paternalistic. The authority structure has hitherto been autocratic, as it was necessary for the floor supervisors to refer back to the managing director on a variety of work-related issues.

Automation, however, appears to have induced the firm to liberalise its authority structure. The more specialised and complex character of automated technology and the increased firm size made it necessary to adopt a more decentralised and consultative framework. The authority to hire and discharge the production workers has therefore been devolved to the level of the production superintendent; yet personnel decisions in respect of the office staff still rest with the managing director.

The firm has not yet developed a coherent strategy on manpower and skill development, although automation has brought about a limited measure of rationalisation in the plant's work procedures (notably, pertaining to the operation of the oven setter), intensification of technical knowledge/skills as well as the accentuated frequency of informal work briefing on the shopfloor. Given its limited size, it was probably uneconomic for the firm to involve itself in a too sophisticated and structured manpower programme—apart from the rather rough approximation, at intermittent reviews, of skill provisions by the rule-of-thumb. Possibly, the determining influence on the firm's decisions on manpower adjustments was the market imperative for it to meet the delivery orders of the purchasing firms (often the larger garment factories that sub-contract to this shop). This was because of the anxiety of the firm to remain flexible in its level of work and manpower utilisation in gearing to the seasonal variations of production orders. Like the printing shops, this pleating plant was not prepared to allow problems of manpower shortage to impede its flow and level of operation warranted by market demand for its products.

Apparently, the incentive to save on labour was one of the reasons for technological innovations. However, a degree of short-run flexibility was built into the workforce offering attractive wages in the casual labour market. Yet in the long-run the plant was oriented towards training its own human resources, particularly in light of its technical advances. Thus, the training of workers as an in-house activity has become more important since 1979. The shop, for instance, provided two years training to the three skilled tradesmen who in turn taught and supervised the others in their work teams in operating the new machines and maintaining them. Usually, new workers received about a week's on-the-job training, aided and supervised by the more senior workers. When new machines were installed, the supplier agent generally undertook to offer training for the machine by seconding a technician to the plant.

The imprints of techno-structural rationalisation on this pleating plant were on the whole feeble. In part, this was attributed to the managerial strategy of selecting the younger and more inquisitive-minded workers and fitting them to the newer technology/machinery hardware. Recruitment of workers has become stricter and more selective. Speed of operation is the most important attribute desired. Younger applicants are preferred since they generally can adapt better to technological variations. Placement of workers has become stricter too. Younger workers were placed in automated operations whilst older workers were assigned to the manual tasks. On the other hand, it did not appear that other personnel functions such as pay, performance appraisal, discipline have been affected importantly by the technical advances in the production process.

In summary, the firm's orientation towards the development of its human resources was *ad hoc*. Internal training was by and large an unstructured process of on-the-job osmosis. At sporadic intervals, the senior staff might be sponsored for specific managerial skill sessions organised by its principals, or specialised technical training might be provided by the vendor/supplier when new machines were

installed.

Stemming from automation was the firm's decision on decasualisation, around 1980-81, whereby the workers' status changed from the casual daily-rated to the permanent monthly-rated system. At the same time, the factory regulations and the employment contracts were streamlined and harmonised with the relevant labour laws. Such reform measures in hiring norms and payment system were in part inspired by a 1981 workers' upheaval that was probably symptomatic of the workers' reaction to the automation process. Before that, labour turnover among the newer workers was accelerated by the work re-organisation that attended automation (although the old-timers remained relatively stable in their employment). Adding to this was growing factionalism bred by the restructuring of work groups on the shopfloor. Intra-group and inter-group rivalry sparked off an episode of *en masse* resignation in 1981, which alarmed the management and induced it to shift to the monthly payment system in order to stabilise the workforce.

Case IV: a university library

One of the non-industrial organisations studied in this series was the library of the University of Hong Kong. The library dates back to 1911, the year the University was founded. With a staff strength of 160 (including both professional librarians and office workers), the University Library is made up of eight functional departments (circulation, reference, book order, periodicals, catalogue, inter-library loan, reserve book loan and special collection) and seven service points (including the main library and its branches in Chinese, medicine, dentistry, law, education and music).

The library first became involved with new technology during the 1960s when office mechanisation was introduced for tasks such as filing, classification, punching and punch-card sorting. Computerisation was introduced in 1969 but, during its initial stage, was limited to information retrieval using the batch mode. In 1972 the reserve

book room piloted a project on computerised data-processing (basically for catalogue printing). With the aid of an allocation from the Government University Grants, in 1978, the library launched upon, the present comprehensive programme on computer application. By 1980 cataloguing was computerised for the whole library service, except the Chinese section.

The official rationale for introducing advanced information technology to the library did not arise from a desire to save on labour as much as from an interest to upgrade the quality of library service and to improve its capacity to handle a larger volume of data and information. No separate provisions were made within the library for research and development purposes for example in information and computer technology. Instead, it has until now depended upon the university computer centre for professional advice and support in the development and application of computer programmes and systems.

Over the previous five years, the staff complement and the work organistion of the library were not affected seriously by computerisation. The installation of the associated hardware was normally preceded and followed by work group briefings held at more frequent intervals–both internally within the library or jointly with the specialist staff of the computer centre. Staff size remained by and large stable, but there was a plan to strengthen the technical personnel now that a new post of deputy librarian was added. As regards work routines and procedures, the library now found it necessary to prescribe and generate a greater volume of written instructions, rules and memoranda for the staff's reference. However, there has been no significant variation in the average span of control within the library's supervisory structure, as the size of the work units persisted under more or less the same arrangement in spite of computerisation. Naturally, the task nature and skill requirements for some jobs have been altered, but these were largely the result of substituting routine clerical duties with computerised operation. The labour saving potential as such

was, however, offset by the growth of library service and allied activities as the user population grew rapidly, reaching 21,800 in size. Work rationalisation, however, did not alter the fundamental job nature of the professional librarian staff, whose task responsibilities remained basically intellectual.

There have been no overt symptoms of staff apprehension provoked by the process of large-scale computerisation. Labour turnover has not been stimulated visibly as a result but has always remained low (partly because of the bureaucratic and secure nature of university employment). However, sporadic signs suggesting the resistance of the library staff to office rationalisation and advanced information technology were not totally absent. For instance, they resented and were hence opposed to the related idea of introducing the 'Americanised' style of workload reporting–a measure which they suspected to lay the individuals open to supervisory scrutiny and intervention in performance.

A sample of 15 library staff members was interviewed in order to ascertain the staff's orientation towards this technological process. On the whole, the members appeared to be acquiescent when they were asked to re-capitulate their views and feelings on 15 job dimensions, as before and after large-scale computer application. Statistical T-test revealed no significant variations in these 15 variables, as given by the respondents' answers.

This library formulated its manpower programme and annexed it to the University's programme so that it could be reviewd at regular intervals. Typically, this took place within the overall administrative framework of the University's triannual development plan. Being part of a bureaucratically oriented service organisation, the library was relatively free from the constraint of external clientele demand in monitoring its manpower provisions. Instead, it appeared to be most anxious with the internal administrative issue of maintaining organisational stability. In descending order of importance, the following factors were identified to affect the library decisions and

activities in its manpower and human resources utilisation:

(i) Manpower wastage through labour turnover, absenteeism and sickness;

(ii) Budgetary and other cost constraints (for example, costs of training or otherwise, the costs of additional manpower intake or of other manpower strategy);

(iii) Benefits expected from the acquisition of manpower for the production process; and

(iv) Technical requirements for production and other specialised skills for maintaining organisational activities.

In order to make up for its manpower inadequacies, it has been the policy of the library to recruit qualified librarian staff from the wider labour market, the scope of which was transnational as these job openings were advertised abroad. Alternatively, a lesser option was to train and promote in-service staff, in as much as there was a ready internal labour market for these skills.

However, the library seemed to lack a specific design for structured and regular staff training—apart from occasional sponsorship of its staff members to attend seminars and other training sessions organised by outside agencies on software instruction and usage. Rather, training typically occurred in an imperceptible fashion through the osmosis process of on-the-job attachment and practice, reinforced, where necessary, by reference to the departmental manuals and guides on job descriptions, work procedures and other staff regulations. On the whole, training, recruitment, performance appraisal and other manpower functions in the library were affected by computerisation as these became more biased towards the possession or acquisition of specialised knowledge. Such aptitudes and abilities were apparently increasingly stressed at both the senior (professional librarians) as well as junior (clerical) levels.

Case V: a bank

This leading bank was founded in 1864 and at present incorporated

locally in Hong Kong under predominantly British management. It had a workforce of more than 20,000 local as well as expatriate staff members assigned to a network of more than 200 branches in Hong Kong offices overseas, making it one of the biggest private employers in the territory. At the head office, the main functional divisions were local (Hong Kong) banking, international banking, planning, personnel and staff, legal, insurance, merchant banking, banking services, technical services, internal audit, and group finance.

The bank's elaborate manpower hierarchy was made up of four broad strata. The upper tier was a matrix of managerial grades including the executive chairman of the board of directors; deputy chairman; executive director; general manager; assistant general managers; senior managers; managers; deputy managers; assistant managers and sub-managers. Belonging to the intervening layer were the staff officers, of whom there were three levels. Under them was the broad stratum of clerical grades, including the tellers and cashiers, who were themselves differentiated into four levels. Making the bottom tier was a pool of non-clerical service grades such as the janitors, messengers and others.

This bank started computerisation in the early 1970s. The rationale of this scheme was, firstly, to improve its quality of customer service and to enhance its staff productivity. Also, by making available an efficient network of information collection and exchange, such a computerised data-base helped upgrade managerial performance since supervisors and managers were better equipped in their control and decision-making capabilities. Furthermore, the salient functions of teller operation, customers' account register and transaction records now became fully computerised, including the more recent introduction of auto-telling machines, the use of robots for transporting bank notes and the adoption of computerised banknote printing. During the period 1973 to 1984, as a result of productivity advances made possible by large-scale computerisation, the average staff member was now able to process twice the volume of

transactions.

The technical service department was the principal functionary in the organisation responsible for research and initiating technological and method innovations. It had a staff strength of 600, of whom 400 were deployed for development and research activities while the other 200 were assigned to a variety of operational duties (such as cheque-book printing). Obviously, this department played a strategic role in steering organisation-wide innovations. Its growing importance to the bank was indicated by the steady increase of the relative share of its aggregate expenditure in the budget estimate: 7 per cent in 1970, rising to 12 per cent and growing to 17 per cent in 1985.

In addition to technological changes, this division was involved jointly with the group method and research department in holding organisation and method studies that resulted in work rationalisation, office automation and simplification of clerical tasks. In introducing technological hardware, the technical service division is typically responsible for the project's commissioning. Such a portfolio entails contract negotiation with the vendor, design of the material handling system and of the relevant management information system.

The organisational structure of the bank has been relatively stable during the previous five years. Hence, work rationalisation brought about by technological innovations has not given rise to any staff layoff or retrenchment. This was largely because any redundancy stemming from obsolete job and skill had been absorbed by additional manpower demand generated by business growth—made possible in part by the large-scale application of the computer.

At the specific level of the work organisation, it had been possible to identify the repercussions of computerisation on several dimensions, as in (i) the job and performance of the teller staff; (ii) the quality of managerial control. (iii) the density of committee meetings and (iv) standardisation of work procedures and manuals.

The bank tellers now became more customer-oriented in their

job performance and emphasised their social and human relations skills in dealing with the clientele. There was hence a shift in the approach to the job specification of these personnel—from a previous emphasis on technical accuracy in handling transactions to that now attached to customer-staff relations. Such re-orientation stemmed in large measure from the automation of much of the routines formerly incumbent in the cashier's job. Numerical control to ensure the accuracy of deposit transactions and the authentication of customers' deposit demand became built into the bank's computerised data system, so that the teller's role could be directed more towards enhancing the quality of person-to-person service. Such premium on sociability was reflected in the in-house training programme for the rank-and-file including the teller and cashier staff.

In the second instance, computerisation enabled the bank to marshal, store, collate and retrieve a much augmented amount of information at strategic points for managerial decision-making. Moreover, the enhanced flow of data contributed to centralised control at the head-office as well as facilitated devolution to lower-level decisions at the branch offices without the need for upward reference before high-value transactions were decided upon. Because of the newly installed information system, the various offices and departments of the bank could now communicate with each other more quickly and on a more extensive basis. As pertinent information became more readily accessible to all levels at multiple points within a much shorter time interval, an organisation-wide network of data-processing and information-exchange was strategic in advancing the performance and productivity of the bank.

Managerial control was also facilitated by the standardisation of work procedures which could be streamlined and simplified with the aid of the programmed information system and the support of office automation. Thus, there had been a growing volume of office manuals that laid down standard rules and practices for defining the performance norms of different jobs. The increasingly programmed nature

of such activities probably implied the reduced scope of human discretion at work. On the other hand, supervision was improved in as much as superordinate intervention could be substantially saved and invoked only so as to correct deviations.

The introduction of new information technology made it necessary to increase and intensify, both spatially and over time, the interface of information flow among and within the various functional departments in the bank. Accentuated traffic of information hence gave rise to more frequent meetings for such purposes as the harmonisation between and within departments on their policies, plans and action programmes, or the joint steering of inter-departmental projects and schemes.

In summary, computerisation appeared to have enhanced, within the organisation, both vertical control as well as lateral linkage. This led, for instance, to a general increase in the span of control for most of the operational divisions. In some instances, it was reported that the ratio of subordinates to supervisors rose from an initial level of 5 to 1 to that of 10 to 1. At the same time, new functionaries were created in support of the automation process, say, to look after the ancillary activities of data entry, information collection and interpretation, central operational support and intensified training.

This bank has evolved over time into a relatively well-structured system of manpower planning, control and development. In this situation, manpower forecast was an activity largely devolved to the responsibilities of individual functional departments, regulated by a set of guidelines prescribed by the general manager of the Hong Kong area in the head office. Perhaps rather typical of the strategy of large-scale bureaucracies in building their own internal labour market, in-house training was highlighted as its most preferred method of meeting the bank's demand for human resources, compared with the other options of

(i) recruiting qualified and skilled personnel from the external labour market;

(ii) adjusting the level and intensity of business in order to tailor it to the amount of manpower resources available; or

(iii) introducing labour-saving methods and machines to substitute for labour.

Generally speaking, the management tended to formulate their manpower programmes with reference to several salient objectives, namely:

(i) to stabilise the workforce (*i.e.* to reduce and make up for wastages, absenteeism and sickness);

(ii) to harmonise manpower utilisation with organisationally prescribed budgetary constraints; and

(iii) to meet the customers' demand or the internal secondary demand for ancillary support and services provided to other departments.

Ten respondents selected from the workforce were interviewed to investigate the socio-psychological and human relations impact of technological innovations on bank employees. The respondents were tested for their perception at two points of time, before and after large-scale computer application, on the multi-faceted dimensions of the variables 'job description', 'job opinion', 'work attitudes' and 'work organisation'. Statistical T-test applied to the findings, however, indicated the relative absence of any significant variations that were associated with the respondents' experience with the process. It appears that these respondents shared a globally positive attitude on the process of computer application, believing that it led to job betterment. Their opinions that the process had not adversely affected their opportunities for self-development, work responsibility and peer relations probably suggests either (i) their imperceptibility of the process or (ii) their psychological adjustment to it and its implications on the socio-technical aspects of their jobs.

Case VII: Hong Kong Telephone Company

This company has operated since 1925 under public franchise as the

monopoly with 'the sole right to supply and operate telephone communication' within the territory. During the 1970s, electronically monitored exchange was introduced into the telephone cable network, supported by the installation of a system of microwave circuitry. Automation of the exchange system was more or less achieved by 1980, as the electro-mechanical switch-board systems were increasingly replaced by the advanced digital systems. As mentioned in an earlier section, this process of planned technological obsolescence led the company to institute, at the beginning of the 1980s, a manpower development scheme for training and nurturing its pool of technicians.

In view of the broad spectrum of activities borne by this public utility, this study focussed upon only one of the main service divisions that has modernised rapidly during the previous decade under the impact of computerised technology. This was the Directory Inquiry Service, manned by operators who answered telephone inquiries about numbers. In terms of its personnel hierarchy, this department was made up of seven levels which included, in descending order, the department head *(i.e.* the executive engineer in charge), the senior controller, the controller, the assistant controller, the senior supervisor (and the night chief supervisors), the supervisors and the operators.

Before 1975, answers to public telephone inquiries were processed largely by manual methods using a central register of paper directory. Computerisation was initiated in 1975 on piecemeal basis using the ICL system. Improvements were introduced in the late 1980, with the inception of the Automatic Call Distribution (ACD) system which was able to store and distribute in-coming inquiries in sequential order to be answered by the service operators. Today, this department has a high level of computerisation. It is equipped with three sets of computers, supported by back-up services from the company's data-processing division and system engineering divison. Computerisation contributed to a significant expansion in the

capacity of the Directory Inquiry Service, as suggested by the following growth statistics:

Year	*Staff strength*	*Number of lines*	*Number of calls handled*
1975	–	48	–
1976	133	–	–
1978	–	–	55,700/day
1980	346	182	85,700/day
1985	355	301	120,000/day

The grade of assistant controllers was introduced to the division in 1980, partly to improve the quality of work supervision and partly to enable the service to operate round the clock.

As a corollary to computerisation, there occurred parallel transformations in the organisation of work and the workplace. These included, for instance, job restructuring, centralisation of information and its enhanced circulation, shifts in the style of supervision and work management as well as changing approaches to job training. Thus, on the shopfloor, the telephone operators were now grouped into work stations arranged into T-shaped structures. Because of such configuration, each work station was made up of two work units each comprising eight operators. The span of control, now stabilising around the ratio of one supervisor to eight operators, has on the whole increased as a result of computerisation. The individual operators seem to have lost their discretion in selecting which inquiries on the in-coming queue to answer, now that these inquiry calls are programmed sequentially automatically. At the same time, computerisation has lessened the supervisory need for on-the-spot inspection,

which is further alleviated by the technical possibility of centralising information and checking on the operator's performance through distance electronics monitoring devices. These job changes for the operators and their supervisors have, in turn, given rise to modified approaches to the division's training and managerial styles.

The computerisation process has therefore served to modify the mode of shopfloor supervision, patrol and inspection to the present system of central distance monitoring. Management has therefore, become less directly involved in on-the-spot intervention with the operator's work. This modified system is in a sense less obtrusive and coercive than it used to be. But, it still retains its basic emphasis upon discipline—especially relating to the operators' demeanour in handling the subscribers' inquiry calls. Thus, the operators are closely monitored for faults and substandard performance; appraisal results are fed back at regular intervals to the individuals so that corrective measures can be applied promptly in order to arrest further deterioration in work performance.

Labour turnover rose to annual levels as high as 15 to 16 per cent, presumably symptomatic of the operators' resistance to and apprehension of the advent of new technology and the obnoxious implications of night work. To facilitate workers' adjustment, management ran a two-month training programme on work appreciation. The programme included a series of short talks on both the technical and human relations aspects for both the floor supervisors and the rank-and-file telephone operators.

The in-service training of the operators was provided during their first six months while these new recruits were on probation as trainees. Before the introduction of computerisation, this type of induction training for the novices was conducted primarily outside the job and workplace; training thus detached from the department was organised centrally by the company's training school. However, large-scale computer application later induced the company to devolve its training activities, leaving it as an on-the-job arrangement

to be integrated with the department's operational activities. At the same time, the department was left with the administrative discretion to prepare, for its own training purposes, the relevant training manuals and instructional guides.

Twelve members of this division were interviewed to ascertain variations in work attitudes resulting from the technological transition within the company. The findings were tabulated and subjected to the statistical T-test to determine any significant differences in attitudes before and after the process. Generally speaking, the operators' perceptions of the work organisation worsened, as measured in terms of the attributes of power, division of work, rules and procedures, as well as the strictness of rules. However, these attitudinal variations were not statistically significant. On the other hand, their views of their collegial relationship remained basically unaffected but there was a tendency for them to perceive lessened opportunity for self-development now. A sense of disillusion mixed with a slightly higher level of normality and social isolation was felt by these telephone operators. Nevertheless, these feelings were offset by a slight improvement in the operators' image of their work now seen to be less monotonous and more satisfying. The following is a profile of the workplace, work and some of the variations observed.

> 'The installation of computers gives a new look to the whole working environment. The modern equipment instils a sense of freshness and modernity into the workers. Such neat and orderly and quieter environment has the advantage of making the operators feel at greater ease. Computerisation might have caused teething difficulties in adjustment and learning, but, it seems that many operators take such difficulties as challenges. They are pleased with learning new information and techniques, and many consider the change as an enhancement of knowledge and experience.
>
> 'Although learning to handle the new technology creates certain difficulties for the operators, the nature of the work

is more systematic, and simpler once the workers have adapted to it. This in turn implies that their work is easier to handle – and this helps alleviate their physical and psychological pressure.

'The operators tend to harbour a mild degree of suspicion and apprehension about the lack of adequate disclosure of information by the management. The workers would like to be kept informed as much as possible about the computer, the hardware, promotion, disciplinary system, the whole lot. Knowledge of all this will give them a sense of security of what is going on.

'However, the management may think otherwise. Such information may be too delicate to be disclosed'.

The training programme for these operators, as mentioned earlier, devolved to the departmental level of the Directory Inquiry Service itself. The department was responsible directly for recruiting and training its staff of operators; selection was increasingly oriented towards one's communication power and skill, as well as the associated attributes of voice quality and social manner. Promotion to senior and supervisory levels now placed growing emphasis upon intellectual power and the technical knowledge of computer application. At the same time, training was made a more structured process, defined by detailed training schedules and supported by a standard programme of in-house laboratory training.

Analysis of the Case Studies

On the bases of the industrial study and the six organisational studies, some tentative observations can be made on the implications of new technology on the human aspects of work organisation at the micro level.

Violent and intense reactions of the workforce to the exigencies of computerised technology were conspicuous for their absence in all the workplaces studied. The general quiescent orientation of the workforce was symptomatic of the feeble shifts in its members' job attitudes and satisfaction, work perception and image of the work organisation. Perhaps, that a technologically precipitated syndrome of worker alienation (or, otherwise, of support) on the shopfloor has not been visible is understandable, in as much as those who were recalcitrant or could not adjust would have already quit. Where organised worker response was rather docile as in Hong Kong, 'strike-in-detail' of the individual might serve as a safety value, in a non-militant way, for the worker to register his disagreement or protest the vagaries of new technology.

Nevertheless, the series of organisational studies did not uncover any noticeable surge in labour turnover arising from the introduction of computerised technology – with the probable exception of the telephone directory service. In as much as technological innovations have not given rise to ruptures in work relationships nor provoked any response of agitation *en masse* in the workplace, it may be speculated that the workers have adjusted to whatever structural and task changes the new technology had brought about.

The adjustments of the workforce are attributable in part to the managerial stance regarding the introduction of new technology and its accommodation. One notable feature, among others, was the commitment of these firms to retain workers at all skill levels,

thereby averting the problems of any large-scale skill obsolescence because of technological displacement of manpower.

In other words, the bulk of the workforce was not threatened by loss of job security that often is said to attend the process of technological innovation. That job security has not been a problem in these workplaces is perhaps made possible by their organisational and activity growth—the imperative that forms one of the principal reasons for technological innovation. Automation of the workplace and of work was popularly perceived by management in this study as a strategy to upgrade productivity and augment operational capacity, rather than to save on labour and reduce manpower costs. Not too many workers have to be transferred involuntarily to new jobs to which they might have difficulties in adjusting. The cases of the printing press provide vivid illustrations: the readiness of these plants to retain a significant volume of the older-style printing, despite its gradual displacement by the automated numerical control press. The gradualism of the process permits the more conservative veteran workmen to be employed continuously without the immediate peril of redundancy. Paradoxically, such structural versatility of sustaining a viable mixture of the old and new methods has been seemingly made possible by the fragmented approach that characterises the orientation of most small and medium-sized firms to technological modernisation.

Indeed, there were discernible variations in these organisations' managerial approach to technological innovation—as it ranged from a piece-meal, *ad hoc* and fragmented pattern to a more co-ordinated, coherent and longer-range strategy. Typically, the popular technology dosage adopted in the manufacturing plants tended to be a mixed-bag combining both modern digital control and computerised hardware with a salient repository of traditional skills and manual operations retained. By contrast, the most schematic approach to computerisation was probably epitomised by the examples of the banking institution and the telecommunication corporation. On the other

hand, the automation and office rationalisation of library work did not seem at all pervasive in bringing about any radical modification to the nature of work organisation in the university library.

Managerial approaches to training for new skills and new technologies have not been given too vigorous and schematic a treatment at most of these workplaces, apart from the large-scale bureaucracies of the bank and the telecommunication firm. The industrial plants, notably the small local firms, opted for a more flexible and relatively unstructured mode rather than apportioning a stable share of their budget for training. The typical arrangement was for these firms to make use of outside resources, *i.e.* to entrust the task of technical familiarisation and instruction to the vendor or supplier firm in its commissioning of new pieces of equipment. Otherwise, these factories placed a rather feeble faith in the process of osmosis, trusting that the workmen on the shopfloor would be able to adjust gradually and learn the relevant new tasks and skills through on-the-job exposure. For these industrial firms, their manpower programme can be described as virtually a series of *ad hoc* adaptations and fragmented growth of new skills and dilution of old ones in response to the market imperative of buyers' demands, productivity improvement and technological possibilities of utilising new production methods, hardware and product mix.

It has been argued that these small or medium-sized industrial firms are constrained by their strategic concern for flexibility and their limited financial resources to adopt a low-profile approach to their manpower training, given the variability of their export-oriented market. Presumably, such overt market orientation makes stable planning in manpower and training difficult as well.

Perhaps, the imperceptible manner by which the process of technological modernisation has occurred in these workplaces also reflects the quiescent psychology of the Hong Kong labour force—hence, suggestive of a rather salient factor that underpins the rationality of these managerial stances towards training for new technology.

That Hong Kong has on the whole been free from the problem of a refractory labour force was attested, as in these studies, by the general readiness of the workers and staff in the subject organisations to co-operate with their management on technological innovations, rather than remaining obstinate in the face of new methods and machines. Probably reflecting their Confucian cultural tradition, the Chinese workers appear to have a mild degree of quiet cynicism in relation to authority and instructions issued from above. Such workplace attitudes, regarding order (and the *status quo)* or changes, were discerned by the occupational study of the electronics technicians. 'Their images of the institutional arrangement of this society were generally quiescent–as indicative of their passivistic though occasionally cynical accommodation over some areas but mild endorsement of the system in other aspects'.[1]

Given such an accommodating mood, these workers nurture an acquiescent assumption that changes, both technological and organisational, at the workplace are inevitable. Such innovations, if introduced gradually and in small segments as done by the smaller local firms, were probably less visible and hence psychologically less alarming and threatening to the workers affected. In as much as these workers remain philosophical in complying with managerial authority and its perogative on work arrangement, it might be suspected that they were ready to accept changes in technology and production with little affective revulsion against the process, unless it threatens the fundamental tenet of the employment relationships by impinging adversely upon their job and income security.

The non-problematic nature of workers' adjustments to the rigours of technological innovations in the workplace also can be explained by institutional factors. Given the free market situation of the labour economy, Hong Kong workers could escape the onerous repercussions of inhospitable skill and job dilution by quitting. Where those affected leave their jobs the technological syndrome is somewhat disguised and less visible.

Labour turnover thus serves to absorb, at least in part, the brunt of technological advances. But, evidently, turnover at too high a level is a cost in human resources to the firm. Interestingly, most of the firms studied did not appear to have been beset by inflated labour turnover problems following the introduction of modern hardware.

Paradoxically, a facilitating factor in the less bureaucratic smaller shops has been the fragmented and piece-meal way technological innovation was introduced. Even for the large modern bureaucracies of the public utilities and banking sector, the management of technological innovation has also been devolved typically to lower level units such as specific divisions or departments. In as much as the workers' job security and wage stability are safeguarded, the informal and low-key approach of the subject organisations to the introduction of modern technology is ironically efficacious by not provoking too visible an image of change and hence too vigorous a defense consciousness in the employees' mind. This observation, still largely impressionistic up to the present stage, brings into focus an interesting issue in the formulation of an appropriate strategy in managing technical and related structural changes in enterprises. Specifically, is it likely, by implications to the contrary, that an inculcated approach that wittingly (or unwittingly) highlights the anxiety of the enterprise management to secure consent at all levels of the work hierarchy to techno-organisational changes might perversely undermine workforce stability if an unnecessary amount of alarm and apprehension was thus precipitated?

Implications for training and human resource development: some factors

With the preceding studies as a background, it may be useful to speculate on the implications of several variables that are of seeming significance in affecting the activities and performance of work organisations in the process of introducing new technology to their production and workforce. These are (i) the nature of their product; (ii) the

conditions of the product markets and marketing methods; (iii) the specificity of the production technology; (iv) firm size; (v) properties of the labour force; and (vi) orientation of management. These organisational factors will be briefly reviewed before the institutional framework of manpower policies in Hong Kong is discussed.

Nature of products

The industrial structure of Hong Kong, by the nature of its product mix, is such that it is not highly geared to rapid technological innovations and enterprise-specific training for such purposes. In part, such an attribute is inherent in the composition of the industry made up predominantly of small and medium-sized firms which produce either for established markets or for overseas franchise as prescribed by the buyers. On the other hand, product adaptations are more usual but these are more likely to be limited to marginal modifications, such as packaging to suit local production conditions. Indeed, wholesome and ingenious input of research resources for product design or product conversions is relatively unknown here.[2]

Probably, the Hong Kong situation can hardly be taken as typical of the new or developed industrial economies. For instance, Korea and Singapore appear to have nurtured their respective modern sectors by introducing high-technology industries. Presumably, modern enterprises of this nature, as they may also be found in the public utilities and new industries in Hong Kong and other places in the Asian-Pacific Region, tend to place a significant premium on inplant training and manpower programme aiming to build up a ready pool of proficient technical personnel to manage and operationalise new technology. This strategy is geared to the notion of an internal labour market, often backed by in-company training of the technical staff for specific tasks. The new systems of work have therefore given birth to greater specialisation in each firm, and each firm models, or at least adapts its own specific means of production.

Conditions of the product markets

On the basis of the previous studies, it appears that the firm's assessment of these conditions represent by far the most pertinent variable in their decisions about human resources. Almost invariably, the managements interviewed in these Hong Kong industrial studies put it as imperative that they needed to adjust their production scale so as to accommodate the shifts in the level of demand for their products in the market. This orientation is perhaps in harmony with the dominant business cult of free enterprise in this territory.

Implied in such an organic responsiveness to market product demand is the elasticity of the firm in adapting to the structural and organisational pressures that follow from technological advances. Few of the companies investigated reported any strong resistance to such changes from within the work organisation or among individuals or groups. In structural, normative or behaviourial terms, it appears that these Hong Kong enterprises are open or amenable to technological and other innovations in production methods. However, these demand-induced changes are inevitably reactive and passive. For this reason, they tend to be *ad hoc*, short-term, fragmented and lacking integration over time and space–as otherwise monitored schematically within a stable framework of a forecast plan. The cyclical fluctuations in the global markets of these export-oriented firms defy any vigour in attempting accurate and detailed forecast on demand trends. These become realistic and potent constraints that dampen the firm's incentives to commit to long-term and large-scale investments to product research, plant-wide modernisation and rationalisation of work processes. The small firms were noticeably reluctant to structure a comprehensive programme of human resource development involving carefully designed training, performance appraisal and employees' career planning.

This in turn explains the paucity of internal training outlays by the ordinary manufacturing shops. These firms would rather exploit external resources in the preparation of their required skill and tech-

nical manpower. Such outward orientation may have its rationale, as it is sometimes argued that the dearth of institutionalised rigidities otherwise connoted by sophisticated in-house manpower training systems permit the individual firm to respond more quickly to the short-run vagaries of the market. Understandably, such an unstructured arrangement has been viewed with scepticism for not favouring the independent conception of new skill and scientific capabilities that support the systematic stimulation of inventions, research initiatives and other strategic resources that together might generate a self-sustaining stream of technological or product innovations that contributes to plant efficiency.

Specificity of the production system and technology

The specificity of the production technology depends largely upon how special or particularistic is the nature of the products that the firms process. In Hong Kong, manufacturing activities tend to operate within a relatively narrow range of product mix and are probably not highly differentiated. However, where the plants deal with relatively specialised products, there is a structural-technical limit on the degree to which they can profitably utilise public training/educational facilities provided at the industry or economy level. This appears to be the situation of the telecommunication corporations, as well as that of a brewery, a tobacco processing works and a high-technology power switch factory investigated in an earlier ILO study.[3] They are therefore induced by the positive incentive of exploring more efficient production and work arrangement to develop their own training and manpower resources. These 'internalised' investments in human capital seem to pay off well, especially if the knowledge thus obtained may reinforce the development of enterprise-specific technology in production, quality control and calibration.

Firm size

The size of the firm and its scale of operation is an important factor

that helps describe the need and capacity of the organisation in developing a stable pool of trained manpower. By virtue of their size and limited scale, these small firms do not appear to have the resources to absorb personnel overheads of the type undertaken by the larger organisations. Often, the majority of these small and medium-sized firms have to rely upon the payment of good market rates to attract trained, qualified and readily usable personnel from the open market, as well as the development of mutual trust and personal bonds with the serving workers in order to retain them. On the other hand, the larger firms not only possess better resources to 'internalise' their training facilities and labour markets but also because of the specific nature of their products, technology and production methods, these plants tend to place a higher premium on specialised, in-house training to sustain their operational activities.

Property of the labour force

The industrial studies in general suggest that the workers are more receptive and admissive to technological innovations, new products, machines and methods if they are younger in age, local-born and of higher educational standard. In addition, mention has already been made of the social psychology of Hong Kong workers – they are in general quiescent rather than recalcitrant in accepting, accommodating and adjusting to changes decreed by the (managerial) authority, provided that these changes are not too fundamental as to threaten their job and income.[4] This in part explains the relatively non-problematic experience reported by the firms in introducing new technology, as it was typically brought about in an imperceptible, low-key fashion on an *ad hoc* and fragmentary basis that permitted skill continuity rather than discontinuity. Given the traits of the labour force, it facilitates the adoption of a relatively flexible and unstructured approach to new technology which, it may be argued, appears a rational strategy for the smaller firms.

Linkage of firm and its management

It is plausible that a firm of 'cosmopolitan' management is more receptive to the transmission and diffusion of new technology—as when it is transferred internally within the organisational entity of a multinational corporation between its plants sited in different locations. This is somewhat reflected in the discernible differences between the two printing firms (one Chinese and the other British) in this study and also illustrated by the results of the earlier ILO study. In the latter study, a 'geocentric' management and its linkage with the American head office facilitates the producer of high-quality power switches in the high and ready exchange of technological information between the two production/research centres in the United States and Hong Kong. The same may be said of the tobacco-processing and brewery plants. Moreover, the product and production linkages between sister branches within the same multinational umbrella not merely assist the interplant flow of hardware information and managerial/technical know-how but also afford a degree of structural complementarities that help protect the individual plants from the exigencies of their local (product and factor) markets. This in turn creates a more stable milieu within which the subsidiaries can develop and improve on their technological/manpower packages. Thus, an OECD study has pointed out that recruitment and training of local personnel are one of the important issues on the agenda of technological transfer by the multinationals.[5] It is argued that 'the major factor in enhancing technological capability in the firm is an internal learning process through which—combined with education and training—the experience of production yields information and stimuli which prompt the making of improvement'.[6]

The effects of production/technical linkages with other shops may be positive or otherwise in stimulating manpower and technological development. In the previous ILO studies, it appears that the extension into the China market (notably the technology agreement that the tobacco plant entered into, and the joint ventures taken up

by the other works) has induced these plants to initiate the formalisation of their training/manpower function. On the other hand, for the precision instrument shop, market constraints and the imperative to make prompt deliveries of individual buyer-tailored orders make it necessary for the firm to farm out a variety of maintenance and production sub-processes to outside works and subcontractors. Such arrangements often unwittingly add to the disincentives on the plant against developing its own inventory of technical expertise and skills in some areas of strategic and long-term technological importance.

This factor of externalities of the firm and its management leads on to the wider issue of the firm's orientation towards new technology. In this respect, the managerial assumption can be the strategic contextual variables in approaching technological innovations.

Managerial assumptions

Although managers vary in their orientation towards technological innovations, it appears that managerial professionalism in general favours industrial or technological advances. As industrialisation advances, management might become oriented differently towards the technological imperative reflecting the divergent impact of various types of industrialisation *elites* and the style of their leadership. Thus, within this spectrum, Kerr *et al.* differentiated between:

(i) the dynastic *elites* and their conservative stance:

'Under the leadership of a dynastic *elite*, family connections tend to control access to the managerial class. Careerist managers and technicians are employed, but they are kept subordinate to the members of the owner families...and they resist as long as possible the introduction of rational or impersonal procedures to govern relationships within the managerial hierarchy'.

(ii) the 'middle class' *elite* and their pragmatic instrumentalism, which 'tends to favour access to the ranks of management on the basis of individual initiative and competence. This facilitates an

earlier and more rapid development of a professional managerial class.... A society in which the middle class is the leading *elite* emphasises education for the masses rather than for a chosen few alone'.

(iii) the 'colonial administrators' and their ambivalence towards the local population:

'The colonial administrators reserve for themselves the controlling positions in the managerial hierarchies both in government and in industry... The colonial administrators favour an educational system which trains a relatively small number of nationals to assume minor positions in government, and they are reluctant to establish institutions of higher learning to develop engineers, managers, or highly skilled technicians'.

(iv) the 'nationalist/revolutionary leaders' and their chiliastic euphoria about industrialisation:

'The revolutionary intellectuals press for a functionally oriented system of education giving the highest priority to development of technical skills required in an industrialising society as well as to the ideological indoctrination according to the prescribed dialectic. The nationalist leaders, in their rush to embark upon industrialisation, tend to encourage use of both political and professional management, and they may also rely temporarily on foreign management. Nationalist leaders usually press for universal general education and also for functionally oriented institutions of higher learning, and they lean heavily on the more advanced countries for assistance and capital to develop technical colleges and industrial management training programmes'.[7]

The Hong Kong situation can be quite hybrid in terms of the above spectrum. Managerial approach here is probably a mixed-bag of the Confucian tradition (*i.e.* dynastic), the legacy of the British institutions (hence, colonial) and the pluralistic pragmatism of the middle class ethos that inculcates the market and the cash nexus. An interesting psychology has therefore arisen to describe the orien-

tation of private enterprises towards the interwoven subject of new technology, manpower and training policies. The typical attitude articulated by managements, as revealed by the 1985 ILO study and the series of studies described in the preceding chapters, is to see the assimilation of new technology with an open-minded receptivity but, at the same time to remain relatively docile in assigning large outlays for manpower training. Such ambivalence hence gives rise to a usual strategy adopted by these firms in avoiding too heavy investments in in-house training (lest those trained compete on the open market) there is a tendency for these firms to rely upon externally organised resources provided in the array of technical courses in the government-sponsored technical institutes and polytechnics.

Official resources and support

Managerial orientation towards technology and manpower training is affected by the government's training and education policies, and *vice versa*. In Hong Kong, paradoxically, the free market ideology of business in a *laizzez-faire* situation induces the Government to become more involved in monitoring and regulating the supply of trained skill and manpower. Official participation and involvement in human resources training and education are deemed desirable in order to address the vacuum left by the fragmented training activities of the private firms. Official technocratic intervention at the macro level to co-ordinate manpower planning and training is seen as increasingly strategic to meet the demand for specialised skills and technical abilities in view of the upstream movement of the economy towards higher-level technology and a more diversified industrial structure. Recognising that industrial diversification requires a new approach to policies on land, technology and training, the Government recently set up the Vocational Training Council (in place of the former Hong Kong Training Council), the industrial estate schemes, testing inventories and other ancillary services to provide a better infrastructural support to Hong Kong's industry.

Perhaps, such public support and active involvement in the private skill market is routine in the new industrial nations. In the Republic of Korea, for instance, a high-powered tripartite authority, the Vocational Training and Manpower Agency (VOTMA), was set up in 1982 under Presidential Decree to supervise research, development, training and testing for the desired industries. The Philippines, on the other hand, integrates training resources at the national level, including sponsorship of in-plant training via a tax incentive scheme and agreements in training activities with private industries such as automotive, hotel and restaurant, tailoring, retail, construction and engineering.[8]

In the People's Republic of China, the Labour Ministry is responsible for manpower training and in association with the Education Ministry and the Ministry of Resources, administers a nationwide network of state vocational/technical training schools. However, the majority of the technical schools are run by the factories themselves, with apprentice training occurring largely at the plant level. Besides, a third form of vocational training facility has become available from the labour service companies, which are types of enterprises that specialise in organising manpower services for various production activities and thus act as a grass-root agency for training.

Perhaps, Japan provides the most vivid example of a national system that integrates very well private initiatives and public regulation/involvement. The institutional framework is laid down by the Vocational Training Law, enacted in 1958 and amended subsequently in 1974, 1978 and 1985 when it was renamed Human Resources Development Promotion Law. 'The former division between training in public institutions and in industry was removed and the same training was expanded to cover not only initial pre-employment training but also retraining of displaced workers and ugrading training for those in employment'.[9] State-run vocational training institutions became more diversified to include Vocational Training Centre, Vocational Training College, Skill Development Centre and Voca-

tional Training Centre for Physically Handicapped, as well as the special Institute of Vocational Training (for instructor training and research).[10] At the level of private industry, 'the factories organise a large number of special *ad hoc* training courses'—in addition to formal professional training and technical training for those of technical high school graduate standard in the special schools which the firm owns.[11]

Notwithstanding the popular trend in most Asian societies towards the widening role of the State in human resources development and its regulation, what actually prevails nowadays is still probably a mixed situation of manpower training organised at levels both internal as well as external to the individual enterprises identifiable at the successive tiers of national, regional (district) and industrial levels.

With the preceding review as the background, it is now appropriate to survey the macro situation of human resource development in Hong Kong, with reference to the present public policies, their problems and future prospects.

The present official framework

In Hong Kong, increasing attention and resources have been directed by the public authority to the manpower training of the general labour force, as reflected in the evolution of the public agencies responsible for public policies in this field. In the mid-sixties, the Industrial Training Advisory Committee (ITAC) was appointed to advise and recommend to the Government on its long-term strategy of industrial training. The ITAC was re-constituted in 1973 into the Hong Kong Training Council, vested with an advisory role on public policies in respect of 'the measures necessary to ensure a comprehensive system of manpower training geared to meet the developing needs of Hong Kong's economy'.[12] The Training Council was restructured and renamed as the Vocational Training Council in 1982, when it assumed under statute augmented jurisdiction:

(i) to advise the governor on the measures required to ensure a comprehensive system of technical education and industrial training suited to the development needs of Hong Kong;

(ii) to institute, develop and operate schemes for training operatives, craftsmen, technicians and technologists needed to sustain and improve industry; and

(iii) to establish, operate and maintain technical institutes and industrial training centres.[13]

Governed by its basic objective to ensure that Hong Kong's industry, commerce and services will have an adequate supply of trained manpower for their sustained development, the Council is involved in diverse functions specifically 'to assesss manpower demand at all levels; to assess trained needs and to develop and update job standards and specifications, model training programmes and trade test guidelines for principal jobs; to visit a proportion of employers with a view to advising them on their training requirements and demonstrating how improvements can be effected and to persuade employers in both designated and non-designated trades to enter into arrangements for apprenticeship Ordinance'.[14] Such activities are pursued not only at the macro but also at the industrial level –for each of the 19 manufacturing and service industries where an industrial training board has been provided. Secretariat support to the Council is officially organised by the new Department of Technical Education and Industrial Training formed as a result of the merger of the former Industrial Training and Apprenticeship Divisions of the Labour Department and the Technical Education Division of the Education Department of the Govenment.

The official recognition that the development of adaptive human resources has to be 'done not only by expanding higher education and upper secondary education in terms of general education but also by concentrating on the provision of structured vocational education and training schemes',[15] led to greater attention paid by the Government to the development of practical and technical

education. Since the 1970s, a multi-tier system of educational institutions specialising in technical education has begun to take shape under official sponsorship, including 'such educational establishments as polytechnics, technical colleges, technical institutes and prevocational schools'.[16] In the allied domain of industrial training, the official stance has been overtly British in that it advocates the orthodox route of 'updated apprenticeship schemes combining part-time vocational school training with on-the-job vocational education and training'.[17]

Presumably, the blueprint was laid down in a sketch by the former Industrial Training Advisory Committee as early as 1971. While heralding the general principle that practical training in industry 'should take the form of organised apprenticeship schemes for those firms which have the capability of introducing them', it acknowledges the need for flexibility among the smaller industrial firms lacking such formal and independent facilities and recommends official assistance to the latter so as to facilitate 'group training schemes which will make use of the collective training facilities and abilities in the firms concerned'.[18]

Such prescription is translated today into a programme of training centres each built, administered and supervised by the relevant training boards for the various trades such as motor vehicle, electrical, electronics, hotels, machine shops, plastics, printing, textiles and welding. These centres provide a total of 9,000 full-time places as planned.

Notes

1. Ng Sek Hong, *'Technicians in the Hong Kong Electronics and Related Industries: an Emerging Occupation.'* Unpublished Ph D thesis, Faculty of Economics, University of London, 1983, p. 472.

2. Ng Sek Hong, *Training Implications of Technological Change in Manufacturing in New Industrial Countries: The Hong Kong Case*, 1986, pp. 59-60.

3. *Ibid.*

4. Such pacificism in the mind of the Chinese worker – in so far as opposition or other dialectic response to techno-structural changes in the workplace has not been visible among

the workers affected by automation in these studies—can be traced back to the 'particularism in the Chinese approach towards work and business organisations' rooted in the agrarian social structure of pre-industrial China. This tradition of agrarian particularism and poverty helps give rise to an attitude of ideological fatalism that inculcates tolerance, passivity and accommodation, as taught under the Confucian philosophy. According to Weber, this mood of inner-worldly asceticism was rather characteristic of Oriental cultures.

> 'None of these mass religions of Asia, however, provided the motives of orientations for a rationalised ethical patterning of the creaturely worlds. ... Rather, they all accepted the world as eternally given, and so the best of all possible worlds'.

See Max Weber, *The Sociology of Religion*, Boston, 1968, p. 269.

5. Dimitri Germidis (ed.), *Transfer of Technology by Multinational Corporations* Paris: Organisation for Economic Development and Co-operation (OECD), 1977, p. 17.

6. Torkel Alfthan, "The Skill and Training Implications of New Technologies: Some Issues", cyclostyled, International Labour Organisation (ILO), Geneva, March 1985, p. 3.

7. For the source of these quotations, see Clark Kerr *et al.*, *Industrialisation and Industrial Man*, Harmondsworth: 1972, pp. 145-46; p. 167; pp. 167-68; pp. 168-69; p. 170.

8. International Labour Office, *Rural and Urban Vocational Training: Report II for the ILO Tenth Asian Regional Conference*, Geneva: ILO, 1985.

9. Toshio Ishikawa, *Vocational Training*, Japanese Industrial Relations Series Vol. 7, Tokyo: The Japan Institute of Labour, 1981, p. 7.

10. *Ibid*., p. 26.

11. This is a profile of Japan's 'Hitachi'. See Ronald Dore.

12. Commissioner of Labour, *Annual Departmental Report 1972-73*, Hong Kong, p. 13.

13. The enabling statute is the Vocational Training Council Ordinance, 1982.

14. Government Secretariat, *Overall Review of the Hong Kong Education System*, Hong Kong, June 1981, Appendix D, para 9(i), p. 211. Also see Vocational Training Council, *Annual Report 1983-84*, Hong Kong, 1984.

15. Sir John Llewellyn, *A Perspective on Education in Hong Kong: Report by a Visiting Panel*, Hong Kong, November, 1982, para III. 9.8, pp. 104-105.

16. Industrial Advisory Training Committee, *1971 Final Report*, Hong Kong, March 1971, para. 3.15(b), p. 12.

17. See Sir John Llewellyn, *op. cit.*, para III.9.8, pp. 104-105.

18. Industrial Training Advisory Committee, *op. cit.*, p. 13.

Some Problems

Against this background of official sponsorship of manpower development, some problem areas for public policy-making in order to accommodate new technology can be identified.

The first and obvious problem is the dearth of appropriate training resources in the private sector. Such sparsity, as stated earlier, is somewhat endemic in Hong Kong's *laissez-faire* assumption of market sovereignty. The preponderance of small firms in Hong Kong suggests that they can ill afford the overhead for training. The high turnover argument has often been used by private employers to justify their reluctance to involve themselves systematically in employee training beyond the practical exigency of immediate job requirements. That private firms are lacking in rigour on internal training provisions has been lamented by the 1979 Advisory Committee on Diversification in these words:

> 'Few commercial or industrial concerns in Hong Kong have either the space or expertise to provide the training required by their staff. Thus, individual industries and firms have not generally accepted the responsibility for training assigned to them by government policy. ...this lack of industrial training facilities will hamper industry's ability to remain competitive in world markets in the 1980s'.[1]

Thus, the individual firms, given the general rudimentary state of their private training activities at the plant level, tend to rely upon externally provided resources of public subvention. Such externalisation of training arrangements is again re-set for several reasons. First, incongruencies are apt to arise between what is taught at the institutions of technical education and what the job requires in a work situation, in particular if the former tends to be theoretical and biased towards western work practice and organisation. Reciprocally,

it is possible for the ingredients of technical education to become outdated and overtaken by the rapid pace of technological development in the workplace. It is natural for externally organised training in public institutions or agencies to be broad-based, often occupationally oriented in order to transcend the variations in different workplaces and, as such, it may be seen to lack the specificity necessary for production in individual plants.

Hong Kong emulates the British model which has hitherto been strongly oriented towards the occupational/professional notion. In Hong Kong, it appears that the bulk of qualified technicians are trained and supplied by government-sponsored educational institutions. In this respect, they are products of the British-style system that moulds a sub-professional class of technicians. The problem arises, however, when there are increasing symptoms to suggest that such a structured formula of a professionally oriented curriculum does not necessarily suit the societal needs of a city-based, new economy like Hong Kong's. It is feared that too huge an output from these institutions of academically qualified but narrowly specialised technicians is liable to lead to a credential glut on the technician markets.

The future syndrome of the 'diploma disease' may be imminent, if the present state of segmentation of the technician market persists and if the academically qualified technicians continue to focus on the primary market (namely, the civil service, the telecommunication enterprises and other large-scale multinationals and public utility firms) in their search for employment. At present, these public/private utilities and the transnationals probably are able to afford these relatively privileged workers in the primary sector market, largely by virtue of rapid market growth and technological advances in the 70s and early 80s. However, such growth might subside gradually and the attendant organisational consolidation of these plants probably also means the saturation of their demand for these diploma holders. In other words, the primary job market for

these new technicians is susceptible to over-supply if,–

> 'Given the bias of the education system towards the British model, imbalances will be imminent for the occupation unless the public sector and the utility monopolies can expand at a sufficiently fast pace as to offer continuous and ample career opportunities for this mainstream of academically qualified entrants to the technician market. Obviously, the scope of expansion of the blocked specialist sub-category is limited'.[2]

Outside these large, modern, bureaucratic organisations, and within the secondary technician market, it may be said that the premium placed by private industrial plants of lesser scale is less on the possession of formal academic credentials. Rather, the nature of their production situation is such that these technical personnel should possess a ready repository of practical skills so as to adapt with flexibility to a variety of products, production methods and organisational roles/status (including supervisory, research, production, administrative, technical and others).

Given the relatively significant role played by private industrial enterprises, despite their limited scale of operation, in the Hong Kong economy, it may be deemed desirable for the planners of education to re-design the programmes of public educational institutions to be more flexible and broader-based. Such renewed approach will serve to turn out versatile technical specialists who have the flexibility to switch between different assignments in the same work organisation or between jobs in different firms and not as 'technicians' designated to become the lieutenants to the professional engineer in the bureaucratic modern enterprises. Possibly, significant changes have to be introduced into the curricula as there might be a need for enlargement in the scope of technical skills taught but diluted by the academic and specialist contents. A possible formula worth considering is to sandwich on-the-job occupational assignment with a fundamental two-year classroom instruction before entry and afterwards, a series of post-experience refresher courses

of shorter duration to polish and update theoretical knowledge/technical skill by work release arrangements.

It is plausible that such an approach will imply the greater fusion of public and private resources in the field of manpower development. Official intervention in the macro supply of technical manpower by way of economy-wide industrial training/educational policies is problematic because it engenders the endemic risks of mismatching supply (as a long-range planning function) with demand (which is heavily constrained by short-run cyclical variations of the external markets). In this connection, the devolution of these training responsibilities to the private firms, which are envisaged to assume a more participative role in collaborative training schemes under incentives of official grant or subsidy, may serve as a corrective to any supply imbalances that might otherwise result from discretionary planning by public policy-makers.

The problem of harmonising externally provided training facilities with the exigencies of the individual enterprise is perhaps more conspicuous in the case of high-technology industries, as experienced, for instance, by the Hong Kong subsidiary of an American industrial corporation that belongs to a London-based multinational company engaged in the production of information technology equipment. This Hong Kong plant specialises in the production of high quality switching power supplies for computers, telecommunication systems and other automated equipment and devices. Its industrial activities are increasingly automated and sensitive to technological innovations.

> 'A high level of excellence in engineering (which is at present differentiated into the specialist functions of product design, process engineering and manufacturing engineering) and the concomitant organisational conduciveness to technological innovations not merely help enshrine the high quality image of the company's products but also contribute substantially to cost reduction and hence efficiency.'[3]

Given its technological specificities, the company cannot rely

too heavily upon external resources for its own skill development. Only at the level of manual skilled labour, the training method involves both in-plant instruction as well as sponsoring the trainees for part-time day release courses in the relevant training centres organised by the industry's training board. Otherwise, the company emphasises the internalisation of its labour market, defining the ports of entry to most senior appointments by way of training, promotion and internal transfer. Training is accordingly one of the company's top priorities. Commensurate training schemes are therefore instituted for its staff whenever it intends to introduce a new product or a new technique of production. 'Recent examples include the case of high power operation training, touch-up techniques and identification of components. Mirroring its technology consciousness, the firm has defined its training strategy such that the first priority is assigned to technical-*cum*-vocational training for engineers, technicians, purchasing and quality control staff, followed in the second place by managerial/supervisory/leadership training'.[4]

This example points to the related issue of whether technical training can be harmonised across the wide spectrum of firms across the same industry or the economy. Foremost is the problem of uneven technological developments among enterprises, which may give rise to divergent skill requirements according to the production demands of the individual plants.

Such a problem of reconciling in-company and external arrangements in manpower training also arises, in another aspect, from a more or less historical stance of the official policy in distinguishing between the public responsibility for technical education and that of private industry for practical training. The long-cherished official approach of non-intervention into the private labour economy has affected the assumption and framework of manpower policy formulation by the Government. Also reminiscent of British tradition which the 1958 Carr Report exemplified, it has been the official position to prescribe that training functions should belong to the

private sector and that the Government should concentrate on providing and expanding facilities for technical education alone. Such division of labour rests seemingly upon the assumption that industrial training and technical education are functionally distinguishable. The former is practical, normally best provided on the job and should therefore be provided by private industry at its own expense. By contrast, technical education deals largely with concepts and theoretical knowledge, so that it is normally provided in separate educational institutions and as such, is in the jurisdiction of the public sector.

This strand of official manpower policy, corresponding with the Government's economic philosophy that private enterprises should be allowed the maximum latitude of freedom and responsibility, persisted until recently. Towards the turn of the decade, there was a shift in public policy as the Government began to liberalise its hitherto restrained role in private industry training, chiefly in sequel to the recommendations of the 1979 Advisory Committee on Diversification. The Committee, appointed under official auspices to advise the Government on strategies to diversify the economy with reference to the possible creation of new activities in the manufacturing and other sectors of the economy was critical about the inadequacy in the present organisation and scope of industrial training to cope with the needs of industry and commerce for skilled manpower. Accordingly, it recommended the augmented involvement of the Government in sponsoring and financing training schemes in selected key industries. It urged the administration to accept this commitment as a charge on general revenue rather than by waging a general levy on exports. Such recommendations were subsequently endorsed by the Government, implying the re-definition of its manpower policy that coincided with the reconstitution of the Vocational Training Council in 1982.

Such an officially sponsored framework of manpower preparation, whether at the level of the macro economy or for specific indus-

tries, is systematically biased towards the satisfaction of demands. To a large extent, official intervention is justified to correct labour market imbalances; otherwise, the resulting manpower scarcity would prove injurious to the growth and well-being of industry. Therefore, the Council and its training boards are zealous in charting and monitoring both overall and sectoral demands for technical skill through manpower surveys, leading to planned provision in the educational and vocational institutions. Implicit in such a demand-oriented approach is the assumption that the market supply of technical skill can be tampered with, in as much as employers' manpower demand can be satisfied and their competitive power in the international product market can be preserved. However, symmetrical protection of the market interests of the employees is conspicuous for its absence from the official strategy. Discretionary intervention into the skill market, unless controlled with perfect precision, is prone to overproduction in the long-run. This is because expansion of skill supply is not a reversible process and an excessive supply of manpower can hardly be contracted without involving a painful process of redundancy, or an expensive programme of manpower transfer and retraining. The industry is especially vulnerable to fluctuations in demand as these are determined externally by conditions in overseas markets.

The financing of manpower training is therefore problematic in the Hong Kong context in as much as the private sector is to a large extent fragmented, diversified and predominated by small enterprises lacking both the capacity and will to commit themselves to extensive in-company training. Previously, this situation of paucity in training resources was not helped either by the manpower approach of the administration which has been doctrinaire in limiting its role to technical education but abstaining from active involvement in industrial training. Exceptions to this general pattern were found only in the clothing and building industries, where training authorities were created, each empowered to collect industry-specific levies in order

to finance its own training centres and training schemes.

The Government liberalised the increasingly blurred distinction between industrial training and technical education in 1982, so that its general revenue can be now applied to develop not only technical educational institutions but also training centres for industry. In a sense, it may be argued that a more integrated and coherent framework of national manpower policy emerges as a result. Technocratic intervention of this nature, while allowing more centralised co-ordination and rational deployment of the economy's resources in human resources development, places a strong premium on the orthodox methodology of numerical analysis of the economy's manpower forecasts to 'ascertain, in quantifiable terms, the number of skilled workers required for the different occupations'.[5]

Administrative intervention into the economy's manpower supply, in spite of its rational, integrative and non-sectarian appeal, is susceptible to various problems by virtue of its discretionary character. The Hong Kong system is probably not free from such a commonplace scenario for industrial societies:

> 'The main problem with manpower forecasts lies with the general difficulty inherent in social analysis and their dependence upon parameters such as population growth, availability of local capital investment, national and international structural changes, technological innovations and many other variants, all of which have been found to be notoriously difficult to predict. For these reasons, the earlier optimism which greeted the merging of economic planning and manpower forecasting with the design of more efficient vocational training systems has not been tempered with realism and a much greater degree of caution'.[6]

In the case of Hong Kong, the Advisory Committee on Diversification did concede to the possibility of market glut emerging as early as in 1982, owing to the over-production of technically trained manpower for the economy. Such a prospect of over-supply, attribut-

able in large measure to the official programme of manpower development, was outlined in the Committee's 1979 Report:

> 'However, in 1982, the provision at 15,257 was thought likely to exceed the requirement by 26 per cent and the net supply was thought to be adequate to meet the requirement. However, this calculation did not include any allowance for the possible shortfall in the numbers enrolling in the technical institutes....'[7]

This Committee is remarkably silent on the requirements for contingency measures to avert a glut, in contrast to its vociferous concern over the economy's manpower shortage. Such an excess supply of trained human resources is presumably left to the natural lever of market adjustment. By its *raison d'etre*, the official programme is directed towards, in an asymmetrical fashion, the satisfaction of market demands *per se*. The concern is to ensure that the existing and planned facilities in the economy are sufficient to cope with the overall volume of demand, to satisfy the various types of demand, and to respond quickly to changes in demand.

In the 1980 small-scale study of the electronics industry and its technical personnel, as much as 41.5 per cent of the technicians interviewed thought that the polytechnics, technical institutes and other training institutions were likely to overproduce in the long-run. A higher percentage of the same sample (46.6 per cent) felt that their own career prospects could be impaired by the massive entry of new recruits:

> 'On the whole, the engineers (mechanical, industrial, production, and quality control alike) and the electronics technicians were more conscious than other sub-groups about the problem of an excess supply of trained personnel in the skill market... Therefore, scepticism about the future exigencies of the job market prevailed among members of the newer technical sub-occupations which require better formal education and qualifications. Such an observation echoed the Marxist argu-

ment about the frustration of the educated masses brought about by over-production of the educational institutions and consequently, by the plight of their "educated unemployment"...'[8]

What might be said to have accentuated the vagaries of planned official intervention in the *laissez-faire* milieu of Hong Kong are the vicissitudes of open and free market pressure. In order to accommodate swiftly shifts in product demand, these Hong Kong enterprises in normative, structural and behavioural terms 'can be mostly described as open or amenable to technological and other forms of innovations in production methods and means of production (notably, the introduction of new machines, increasing automation and the training for new skills and manpower)'.[9] Obviously, these demand-induced adjustments are by and large responsive and retroactive. It follows that these responses tend to be *ad hoc*, fragmented, short-term, lacking integration over time and space, as well as defying schematic planning within a stable framework. Moreover, the export orientation of their product markets renders it difficult, if not impossible, to attempt detailed forecast so as to monitor future demand trends—given the cyclical fluctuations of global demand. Thus, these factors impede the incentives of the smaller industrial enterprises to involve themselves in such long-term and large-scale human resources investments.

In a reverse sense, it may be argued that the relative dearth of institutionalised manpower/training systems established by the individual enterprises may (indirectly) facilitate their quick response and adjustment as consistent with the short-run economies of their production situation. Instead of seeking to develop a consolidated internal labour market, these firms, especially where they have to face the exigencies of market uncertainties, prefer to recruit experienced personnel directly from the open market (say, by the offer of high wages) or to farm out the relevant sub-processes to specialist subcontract workshops. Still, the fundamental problem remains that

such an unstructured and fragmented state will not favour the creation and conception of new skill and technical/scientific capabilities which can be the key to the systematic stimulation of inventions, research initiatives and technological/product innovations.

The externalisation of training resources, as provided in public-funded educational institutions or training centres, may be said to be congruent, however, with the product structure of an industrial economy. In Hong Kong, manufacturing activities tend to cluster around a comparatively narrow range of product mix[10]—hence entailing a high degree of commonality or similarity in production technology, method and conditions among these industrial enterprises.[11] Often this means that production skill and technical knowledge are to a certain extent transferable across these industrial firms or they are of sufficient generality as to be readily adaptable to production requirements even if these workers acquire their skills just merely through practical on-the-job experience or receive instruction/training of a generalised nature in technical institutions.

Of course, as the economy advances to a higher technological state, enterprises in the modern sector are likely to develop increasingly differentiated technology and production methods. This was observed in some of the large modern utility and manufacturing plants studied in the ILO series, *e.g.*, brewery, tobacco plants and the power switch factory. In structural-technical term, there is hence a limit to the manner by which these enterprises can profitably utilise outside training facilities provided at public or industry-specific institutions under government sponsorship. Instead, in the search for improved technical and task performance, they are induced to develop their own facilities for manpower training. Such in-house investment is illustrated in the example of the power-switch factory where it supports the development of company-specific technology in production and quality control. Moreover, it affords an attractive strategy of internalising its trained skill and technical personnel and attaching them to the work organisation—notably, the method of

'objective integration'.

Certification of competence and status recognition

In large measure, the issue of qualification (or certification of competence) is determined by, or at least associated with, the relevant public policy on technical education on one hand and the orientation of the private employers in their recruitment strategy and standards on the other.

In Hong Kong a rather mixed hierarchy of specialised educational institutions modelled largely upon the British system of polytechnics and technical colleges has evolved under official sponsorship. These institutions are comprised of the universities, polytechnics, technical institutes, and prevocational schools. This multiple tier of institutions is stratified broadly in congruence with corresponding levels in the manpower structure of the economy. Generally speaking, the universities specialise in the preparation of the technologists or engineers; the polytechnic is tailored to the production of mid-layer technologists and technicians; the technical institutes cater for the training of technicians and craftsmen; while the prevocational schools, vocational training centres and the like are chiefly concerned with the preparation of junior technicians and craftsmen. Out of this four-tier hierarchy there has emerged, within the time span of just more than a decade, a stratified matrix of (overlapping) institutional courses that certify the students for different levels of vocation-related academic qualifications.

On the face of it, such a constellation of institutional courses helps consolidate a centrally co-ordinated vocational strategy at the national (economy-wide) level by defining the different ports of entry to various technician and technologist jobs in the skill market. These diverse routes to technical employment have been identified and propagated by the Vocational Training Council and its subsidiary industrial training board. According to the Council blueprint, the two-year full-time Diploma or the part-time Certificate/Higher Certi-

ficate programme offered by the polytechnic is to equip students for employment as technicians. Correspondingly, the three-year Higher Diploma course, also provided at the polytechnic level, is geared to the training of technologists/engineers. These academic credentials are not only supposed to certify for entry into technical employment but also help qualify candidates for professional status (at least partially) granted by British-based professional institutes of engineering. An example is the exemption extended to the holder of the Polytechnic Certificate or Diploma by the Institution of Electrical and Electronics Technician Engineers from the academic requirements of Technician Associateship, and by the Council of Engineering Institutions (CEI) from its Part One Examination to holders of the Higher Certificate or Higher Diploma. Obviously such certification has been made possible by an element of built-in academic linkage that the system of Certificate/Higher Certificate and the Diploma/Higher Diploma is closely modelled after its British counterpart (the system of Ordinary National Certificate, Higher National Certificate, Ordinary National Diploma and Higher National Diploma.[12]

In a sense, such British linkage is not unusual for a young society like Hong Kong–given the historical legacies owed to the UK. Here, as in other new urban economies, an indigenous system of academic and professional qualifications has not been sufficiently developed to attest standards of proficiency in the performance of specialised technical tasks. Accordingly, in the modern bureaucratic sector (including the civil service, the public utilities and the British multi-trading houses), these primary sector employers place a premium on the series of professional credentials as they are recognised by professional institutions in the UK. Paradoxically, that the 'parent' institutional practices persist stifles the prospect of a more autonomous system of technical and professional education to evolve on its own in Hong Kong. It becomes a vicious circle, in as much as 'all young engineers, knowing that they have to join one of the UK

institutions to obtain a professional engineering post with the Government or the Government's consultants, will obviously embark on the UK selection procedure and in turn join us (the Hong Kong Institution of Engineers) by exception if they bother to do so at all'.[13]

Nonetheless, what is discernible in the private industry is virtually a pluralistic state of credential hiring or hiring without credentials, in spite of the overall 'appearance of increasing importance employers in the industry now attach to formal academic credentials'.[14] Co-existing with the foregoing credential structure constituted of the local equivalents of the British National Certificates and National Diplomas is a fringe of technician courses, now available at the Polytechnic but to be gradually relocated to the technical institutes under the official strategy of curriculum rationalisation. Most of these courses are of shorter duration, lesser in academic intensity but with correspondingly a great degree of practical orientation. Also reminiscent of the British tradition is the fact that these courses emulate extensively the model set by the City and Guilds of London Institute. In other words, operating at a level below the polytechnic are the technical institutes which organise technical courses at the craftsman and lower technician levels. The curricula are also pluralistic, duplicating to a certain degree those of the polytechnics–although such overlapping can be said to be transitory, given the ultimate target to concentrate the higher certificates/diploma courses in the polytechnic and to consolidate the (ordinary) certificate and diploma courses in the technical institutes.

Apart from obtaining technical education from local institutions, graduate technical personnel may also be trained in universities in China, Taiwan and other countries – mostly in Anglo-American institutions. Generally speaking, lower standing and market value are attached to the academic qualifications obtained from Chinese/Taiwan tertiary institutions, but the Anglo-American institutions can claim equal footing with local universities.

In addition, there is a plethora of electronics and computer

courses offered by privately-run trade schools at the lower end of the educational spectrum. On the whole, these courses lack sophistication and systematic theoretical exposition but are considered sufficient to initiate young people into the handling of simple diagnostic problems required of a technician in, for example an ordinary electronics plant. This route has been tenable in Hong Kong's industry which, despite its rapid development, is still not committed to the notion of manpower selection solely by the criterion of formal academic qualifications.

These less qualified or even self-made technical workers—in as much as their labour power is attributable more to their shop-floor experience than their academic credentials may be considered as a major source of technical manpower supply for the medium-sized and smaller plants at the technician and engineer levels. The smaller enterprises, mostly financed by local Chinese capital, are less qualification-conscious compared to the rest of the industry for several reasons. Firstly, most of these smaller factories operate in product lines of less technological sophistication, so that they can afford to operate with a comparatively low overhead on their research, diagnostic and innovative capabilities. Often, this implies a lower premium that the enterprise attaches to the academic standards of their technical staff. Secondly, there is a labour market factor that arises from the relative difficulty of the smaller plants to compete with the bureaucratic monopoly capital or public enterprises in bidding for the academically better qualified technicians. Rather, their lower competitive power compels them to move downstream, in diluting their recruitment standards by exploring the non-qualified segment of the technician market. In the third instance, structural specificities of these plants also contribute to their lower degree of formalisation in their recruitment criteria. In their search for the least expensive option to achieve production, their selection of technical personnel is governed primarily by consideration of instrumentality. Given the imperative of production expediency,

these small employers cherish the elements of 'proven competence in the job', which may differ from 'externally derived academic qualifications' as the yardstick to judge a technician's performance.

Notes

1. *Report of the Advisory Committee on Diversification*, Hong Kong, 1979, para. 397, p. 239.
2. Ng Sek Hong, *Technicians in the Hong Kong Electronics and Related Industries: An Emerging Occupation?* op. cit., p. 448.
3. Ng Sek Hong, "Training Implications of Technological Changes in Manufacturing in New Industrial Countries: The Hong Kong Case", July, 1985, p. 111.
4. *Ibid*, pp. 114-115.
5. International Labour Office, *Rural and Urban Vocational Training, Report II for the Tenth Asian Regional Conference*, Geneva, 1985, p. 6.
6. *Ibid*, p. 6.
7. *Report of the Advisory Committee on Diversification 1979*, Hong Kong: 1979, p. 225.
8. *Ibid*, p. 332.
9. Ng Sek Hong, *Training Implications of Technical Changes in Manufacturing in New Industrial Countries: The Hong Kong Case*, op. cit., p. 126.
10. The 1979 Committee on Diversification observes: 'Given the relatively small size of the economy, and the severe constraints—particularly in terms of the limited supply and high cost of industrial land—under which Hong Kong's manufacturers have to operate, the tendency to specialise on a limited range of product groups was probably inevitable' *Report of the Advisory Committee on Diversification, 1979, op. cit.*, para 426, p. 253.
11. To such an extent, 'virtually all manufacturing firms in Hong Kong' are likely to make use of such a pool of industrial support facilities and technical back-up services, if these are erected and developed by the Government at the central level. For further details of such an opinion held by the Advisory Committee on Diversificaton, see *ibid*, para. 435, p. 259.
12. Ng Sek Hong, *Technicians in the Hong Kong Electronics and Related Industries: An Emerging Occupation? op. cit.*
13. A.J. Vail, "The Institution's Future", (Presidential Address to the Hong Kong Institution of Engineers, October 1980), *Hong Kong Engineer*, November 1980, p. 9.
14. This is illustrated, for instance, by the pattern of employers' preference for higher educational standard demonstrated by the Electronics Industry Training Board's manpower surveys in 1978 and 1980. See Electronics Industry Training Board of the Hong Kong Training Council, *Report on the Fifth Manpower Survey of the Electronic Industry, 1978*, Appendix 3, pp. 30-36; *Report on the Sixth Manpower Survey of the Electronics Industry, 1980*, Appendix 4, pp. 32-35.

Possibilities for Public Policies

Against the preceding background it may be useful to outline the possible manpower strategies in public policies. Obviously, the *raison d'etre* is to search for more active official roles in manpower training that can lend more stable and resourceful support to sustained development and the introduction of technological innovations to industry. Indeed, a prelude to these official initiatives was somewhat identifiable in Hong Kong towards the end of the previous decade.

The Advisory Committee on Diversification of the Economy was appointed in 1979 to study and advise the Government on available strategies to diversify and enhance the economy with special reference to 'the establishment of new activities in the manufacturing and other sectors of the economy'. Sceptical in its 1979 Report about 'the inadequacy of the present organisation and scope of industrial training to cope with the requirement by industry and commerce for skilled manpower', the Advisory Committee recommended, *inter alia*, measures to augment involvement of the Government in sponsoring and financing training schemes in selected key industries. Acknowledging the practical disarray envisaged in 'devising either individual or overall (private) financing arangements' for such schemes, the Committee proposed and the Government accepted that such outlays for industry-specific training schemes were to be borne by the administration's annual budget for general revenue rather than by way of imposing a general levy on exports.[1]

Such a liberalised official policy – in allowing a measure of involvement in private industry training – was paralleled by the establishment of a minister-equivalent portfolio in the Government Secretariat. Thus, the Secretary for Education and Manpower has since the turn of the last decade headed the Education and Manpower Branch in the Secretariat, overseeing the Labour Department, Education

Department, Vocational Training Council, University and Polytechnic Grants Committee as well as the Registry of Trade Unions.

The adjunct to these policy re-orientations was the re-structuring of the Hong Kong Training Council, in 1982, renamed as the Vocational Training Council and vested with broadened jurisdiction in manpower planning and training. Along the vein of the re-aligned policy, the British-inherited distinction between technical education and industrial training becomes increasingly relaxed now that the Vocational Training Council is able to mobilise public finance for vocational training in industry-wide training schemes.[2] Specifically, within the umbrella of the Council, its Committee on Technical Education is responsible for managing the technical institutes whereas the training boards are to administer the training centres in their respective trades.

Given the modern manpower hierarchy that is typically made up of successive tiers of technologists, technicians, craftsmen and operatives, it may be said that the present biases are to apply public resources more preponderantly to the training of the craftsmen and semi-skilled operatives. Thus the training programmes offered by the industry-specific training centres address in the main the skill training of tradesmen or semi-skilled workers. Similarly, the thrust of present development in technical education is directed principally towards the craftsmen and the technicians, as provided in the technical institutes. Given the alternative priorities between the various occupational levels/groups within the manpower hierarchy that warrant the preferred application of public resources in their development, it has been deemed desirable to address first the relative shortage of supply of technical personnel at the middle levels—notably the craftsmen, technicians and junior engineers.

Official sponsorship of the training centres under the supervision of the respective training boards can be viewed in part as a strategy to devolve public-funded vocational training to the specific level of the individual industries which thus enjoy higher flexibility

in responding to the specificities of their product, technology and skill demands. This measure of responsiveness is probably desirable, given the export-oriented character of the markets for most manufacturing industries in Hong Kong. Market variability almost precludes any accurate and detailed forecasting attempts to predict future demand trends, save rule-of-thumb estimates. Industrially organised and monitored training, while more adaptable than an economy-wide approach, may need to reconcile with the problem of inter-sectoral adjustments, especially if traditional industries are declining while new ones are emerging. Over-supply of manpower for the former and shortage for the latter can entail a painstaking process of redundancy, transfer and re-training—which can be expensive for both the labour force and the economy.

Therefore, it is likely that the advent of a diploma glut and the associated problem of educated unemployment may also be averted if the economy is backed by a more flexible and responsive official policy on manpower. The lever may lie in a shift of educational strategy, in steering the future graduates of the qualifying educational institutions away from producing narrow technocratic specialists. Instead, these institutions can move along the alternative path of training more versatile technical personnel, that presumably better suit private industrial enterprises' demand for this middle-level key technical staff. Within these less sheltered private industries, the worth of labouring power will be less on the possession of academic credentials to qualify for professional status in specialised occupations or for entry into the internal labour market of big corporations, whose number is relatively small despite their growing importance. Rather, the premium rests on the capabilities of the job incumbents to adapt with flexibility to a variety of products, technical skills and organisational roles/status (including supervisory, research, production and administrative, technical, etc.) that are frequently attributed to such middle positions in these industrial firms.

The objective is therefore to turn out cosmopolitan technical

personnel who are flexible enough to switch between different assignments in the same enterprise or between jobs in different enterprises. This probably entails, in turn, significant innovations to be introduced into the curricula, which should be broadened in the scope of technical skills taught but narrowed in terms of academic intensity and specialisation. A possible approach worth considering is to design a sandwich type of programme, so that the practical job assignment is preceded by a fundamental full-time instructional course for instance, two years' duration before entry. After entry, it will be followed up by a series of post-experience refresher courses–shorter in duration but that will enable the trainee or novice to polish and update his/her theoretical knowledge and technical skill by way of work release arrangements.

It is apparent, in order to facilitate the working of such an instruction-*cum*-practice training model, that closer collaboration between the private and public sectors has to be negotiated and agreed upon. Such proposals virtually envisage a joint arrangement between members of private industry on one hand and official agencies of education and manpower on the other. However, the former will probably be vested with greater responsibility in determining and structuring the contents of training desired or required in their workplace or for the industry concerned.

The new approach is likely to avoid, or at least reduce, the institutional rigidities of centrally administered manpower programme as directed and organised essentially under state control. As pointed out earlier, official intervention into the macro supply of technical manpower, through monitoring manpower surveys, conducting forecast and varying the public provision of technical education, engenders the unavoidable risks of discretionary mismatch–that is, between supply as a long-range planning function and demand which is heavily constrained by short-run cyclical variations, given Hong Kong's vulnerability to external export markets. In this connection, the new approach suggested for the future implies a move to devolve

a substantial share of these training responsibilities to the private firms, whose outlays might be in part offset by the offer of a state grant or subsidy as an incentive to encourage their participation. Conceivably, in order to provide a safeguard or corrective to any supply imbalances that might result from the technocratic planning and discretionary intervention by official agencies, it is important for the Government to obtain more specific and detailed information on the personnel policies/practices of private companies as regards, for example, employment, recruitment, motivation, training, remuneration and transfer, etc. Systematic data on these aspects are far from complete in Hong Kong for elucidating these characteristics of enterprises. A census type of survey may be too ambitious an exercise to achieve. However, the gaps can be filled partly by conducting case-studies or similar types of micro research. The building up of such background knowledge may occupy another important ancillary item in the agenda of the territory's manpower policy planners.

At the enterprise level, as the technology and organisation of work become more advanced and specialised, it will become increasingly apparent that there is a structural-technical limit on the extent to which these enterprises can profitably utilise external and government-sponsored training facilities provided at either the industry or economy-wide level. Rather, they are induced and perhaps, constrained too, to develop their own research and training resources, which not only cater for production needs but also help consolidate the firm's internal market of skills. As suggested by the case of the British Calendar Cable subsidiary (which produces power switches), these internalised investments on human capital appear to have paid off well. Here, the development of company-specific technology in production, quality control and calibration is stimulated effectively by the corporate policy that emphasises training and creative research. This suggests, *prima facie*, that these modern establishments may become more convergent with corporate enterprises in western industrially advanced societies on objective integration of their employees

with the work organisation.

Understandably, these policies of human resources development, whether public or private, may give rise to various implications for both employment and industrial relations.

In the first instance, training that instils specialised skills and technical abilities is liable to breed occupational specialism—differentiated from others by professional yet parochial boundaries to mark the distinctiveness of the insiders. However, such an institutionalised professional model is vulnerable to the problems of rigidities in employment and hence the mobilisation of human resources in light of the demarcational/jurisdictional norms especially when industrial skills become obsolete quickly and are replaced by new ones because of technological change.

The structural stability inherent in the professional or craft model of vocational training, *vis-a-vis* the dynamism of technological advances in modern industrial societies, raises a fundamental issue as regards the basic approach of human resource development programmes—namely, whether these should seek to produce generalist or specialist workers. The rationale can be quite mixed. Too general instruction often means weak relevance to practical demands in the actual work or production situation—as demonstrated by the reservations voiced by the firms investigated in the ILO study about the feeble linkage between their specific skill requirements and the type of professionally or occupationally oriented technical manpower available from the technical institutions. On the other hand, the advent of specialist unemployment as a potential threat implied in the tendency towards job specialism has been more widely felt by the technicians in, say, the technologically advanced industries such as the electronics and telecommunication sectors. Here, the anxiety of the polytechnic and technical institutes to train professionally qualified technicians may unwittingly lead to a situation of manpower glut in the long-run should there be no commensurate growth in the industry's demands. Hong Kong and other export-oriented

new economies are particularly vulnerable to such vagaries, given their openness to the vicissitudes of a rather unpredictable global economy and unstable (and, sometimes, inhospitable) trade relationships. Accordingly, it might warrant, in order to avert the problems of trained unemployment–and the allied syndrome of diploma disease together with its implications of social upheavals–sufficient flexibility to be maintained in the instructional design, both theoretical as well as practical, of these training programmes.

Institutionally speaking, such a policy stance suggests the desirability of devolving decisions on manpower and training provisions to the levels of the industry and of the enterprise directly at issue. Devolution as such, which helps support and enhance the unit's autonomy and discretion at lower levels, probably helps reduce the time lag of response otherwise accruing under centralised planning and regulation under the Government's manpower and flexibility is likely to increase in importance as skill knowledge becomes more specialised. In the context of human resource development and utilisation, technological specialism evidently makes intersectoral, inter-occupational or (even) inter-organisational transfer of skill and job capabilities more difficult. Paradoxically, the place of technological innovation today is such that jobs and skills can become obsolete more easily. Unemployment, it follows, is liable to pose a more incessant problem in so far as specialised personnel displaced by new technologies may find job transfer problematic or difficult to achieve without rupturing their occupational or career path.

Modern approaches in human resource development are also likely to bring about significant implications for industrial relations. This may arise, for instance, under the broadened perspective that sees the employer-employee relationship in terms of human resource investment. The firm is therefore, inclined to institutionalise its internal labour market in order to preserve its inventory of trained manpower. Accordingly, the firm is inclined to develop various personnel practices and policies that induce the attachment of the

workforce, on whose development an increasing outlay is now being spent. By the same token, employees working in this manner are also liable to feel restrained in moving to other firms—partly because of their attachment to the present series of employment benefits and partly by virtue of their skill specificity that makes their transferability between firms less tenable.

Industrial relations are also likely to be affected in as much as a growing section of the labour force now moves towards the occupational route as organisational careerists rather than moving about and responding freely to the supply and demand forces of the labour market, like a semi-skilled or unskilled worker does. In as much as they become occupationally and organisationally more specific and attached, workplace industrial relations may become increasingly the focus of interests for this new generation of technical workers. More sophisticated in their aspirations for a better quality of working life—in search of, say, advancement opportunities, job discretion, industrial authority, job security, organisational and professional identity—these workers are likely to nurture a new form of workplace-based or profession-based union consciousness. Such solidarity may be in part instrumental and rational, as well as expressive and altruistic. 'In this Hong Kong study, the technicans did believe that effective task performance demanded one's excellence in engineering and related knowledge. But such a faith in technical knowledge fell short of an "elitist" type of self-perception as implied by the realm of the "scientific estate". Few of these technical staff considered that their "mental labour" lay at the strategic centre of industrial production—not to mention their docile aspiration to apply their technical expertise in solving social problems. There was little intrinsic demand for auto-gestion and their alienative responses to management were not vociferously antagonistic'.[3]

These new technician workers do not appear to resemble the 'isolated and endogamous nature' of the integrated industrial community of the traditional proletarian workers like the miners, ship-

builders and dockers. While the processes of technological innovation and skill decomposition have recently contributed to the break-up of the formerly homogeneous and comprehensive skill-structure of the traditional occupations, even more differentiated is the variety of skill and technical knowledge now demanded of the technical workforce in relation to the 'labouring process' of modern industries. The identity of an occupation, (it is argued with reference to the Hong Kong study of the electronics and telecommunication sector) is sustained among the workers by their sharing of a loosely integrated labour market. This market embraces a broad family of mutually related and complementary skills and technical knowledge employed by firms located within the electronics, telecommunication and related industries, compared to technicians engaged in other older industries like textiles and shipbuilding.[4]

On the other hand, technological advances appear not to have precipitated any visible and large-scale labour protests. This is due in part to new job opportunities which offset the displacement caused by new technologies. In part also the accommodation of the labour force reflects the quiescent attitude of these workers towards modern technologies as well as the gradual and imperceptible manner these innovations were introduced, notably by the small or medium-sized firms. The rationale implicit in the latter strategy of managing technological change is also relevant to the training for new jobs and skills. In this respect, the tendency of these firms to rely upon practical on-the-job training—partly due to their limited ability to organise highly structured training—has, perhaps inadvertently, ameliorated the anxiety and apprehension of the workforce towards new measures and processes. Thus, in terms of the psychology of organising training in the workplace, the following guidelines may be instructive:

> 'It is necessary ... to take time to ensure that the individual is at least aware of the benefit which might accrue to him from the training he is being offered. ... A potential trainee who is

over-motivated and who sees the whole of his future depending upon a notional success in the training process, may become so anxious about it that he will be prevented from learning: his own anxiety will introduce too much noise into the actual training process itself to permit him to work effectively'.[5]

And on the related question of whether the trainee should be made aware of the theory or background of the assigned sets of tasks, it may be useful to distinguish between logical training and rote training. The basis of logical training is:

'Providing some theory in training has the advantage of helping the individual subsequently to transfer his skills without undergoing further training. If he is taught only a single technique, ... he may have to be brought back for training in another technique. But if the individual has already been taught a certain amount of theory he may, on the basis of his own experience, be capable of transferring the technique originally learned into a new one more apposite to the new technology'.[6]

Notes

1. Hong Kong Government, *Report of the Advisory Committee on Diversification 1979*, Hong Kong, 1979, para. 419, p. 248.
2. This British tradition, persisting in Hong Kong until the turn of the decade, has also been preserved in India where technical and vocational education belongs to the Ministry of Education, whilst technical and vocational training to the Ministry of Labour. The same is also true of Pakistan and Thailand. See International Labour Office, *Rural and Urban Vocational Training, Report II for the Tenth Asian Regional Conference, Jakarta*, Geneva, December 1985, p. 25.
3. Ng Sek Hong, *Technicians in the Hong Kong Electronics and Related Industries: an Emerging Occupation*; unpublished Ph D thesis, University of London, 1983, p. 396.
4. *Ibid*, p. 397.
5. George Thomason, *A Textbook of Personnel Management*, UK Institute of Personnel Management, 1978, 3rd edition, p. 295.
6. *Ibid*, p. 301.

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